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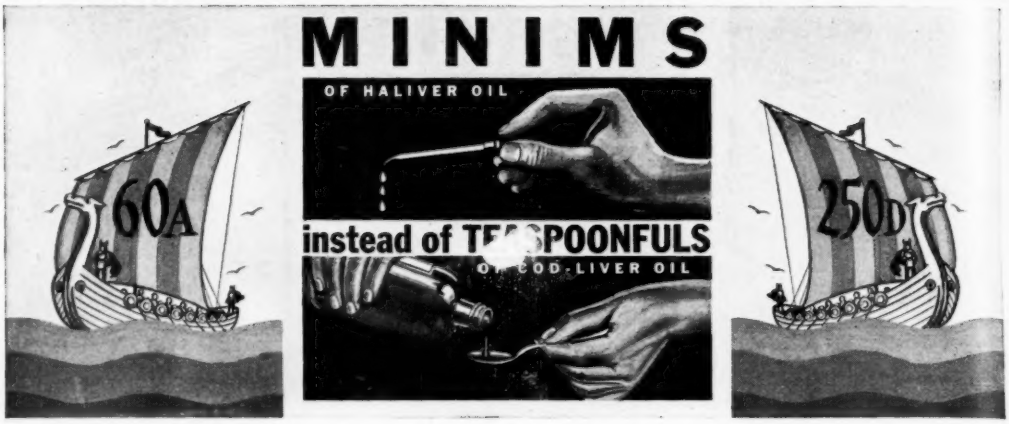

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VOL. XV OCTOBER, 1932 No. 10

HOSPITAL AND MEDICAL CARE OF VETERANS FROM THE VIEWPOINT OF THE DOCTOR

MORRIS FISHBEIN, M.D.
Chicago

AS I listened to Mr. Cliff asking where the American Medical Association was way back in 1918, I thought about an old colored man standing on Michigan Boulevard in Chicago in the middle of January. He had no overcoat. The wind came down from the northwest, somewhere up in this section. As that wind hit the old colored man he shivered and putting his arms around himself he said, "Wind, where was you last July?"

There is no need to ask where the American Medical Association was in 1918. The American Medical Association at that time was just exactly where it is today. It had a membership comprising most of the competent physicians of the United States. It was the only body existing in the United States capable of giving scientific advice as to how to take care of a sick man, and it stood ready to give that advice to the President of the United States, to the Cabinet, to the Senate, to Congress, to The American Legion, or to any other group that wanted that advice. The American Medical Association stood then, as it stands now, ready to give of its utmost on request. No doubt it held off at that time from making approaches to these various organizations, as it has been somewhat delicate in holding off at the present time for fear that its motives may be misunderstood.

Exactly as the hospital association is being charged with having entirely a pecuniary motive in endeavoring to get the vacant beds filled with the veterans that ought to be in those beds instead of in government hospitals, so also the doctors are constantly charged in hearings before Congress with endeavoring to collect fees for themselves instead of having small salaries paid to physicians who work full time for the Veterans' Bureau.

The physicians of the United States do not yield to any other body in the United States in their patriotism. They do not yield to any other body in the United States in their desire to see every soldier who served in the war properly taken care of after that war is over. They want to see that every man—veteran or anybody else who needs medical care gets the best type of medical care that can be given to him. The best of medical care, I can tell Mr. Cliff and I can tell the Veterans' Bureau and I can tell everyone else, is not to be had anywhere except at the hands of a personal, private family physician. The best type of medical care is never given in any institution where men are brought in, standardized like robots, and treated like parts of a machine. The best type of medical care is never given to a man when that man is wrapped up in so much red tape that one can't even see the scars of his war injuries.

I don't care to repeat what happened in 1918 and 1919 when Brigadier-General Sawyer was scratching the top of his desk with his new spurs, hoping that everything would come out all right in the Veterans' Bureau. The doctors of this country know as well as anybody else what the Veterans' Bureau was in those days. It isn't a very happy topic for the Army, the Navy, the Public Health Service, the physicians of the country or the American Legion.

Since that time there has been some attempt to bring order out of the chaos which existed. If you want to know how much chaos still exists, you need merely read the hearings that took place in February, when Mr. E. V. Cliff appeared and

*Presented before the Minnesota State Medical Association meeting, Saint Paul, Minn., May 23, 1932.

when Dr. C. B. Wright, the chairman of the legislative committee of the American Medical Association, appeared for our Association, and when various representatives of the Veterans' Bureau and the Legion and the Hospital Association, and other bodies appeared. You will find there is still plenty of chaos in the control of veterans in this country. We are far from anything that resembles an orderly handling of this problem. I agree with Mr. Cliff that we must have an orderly handling, but no veteran should be permitted to suffer during the time that Congress is making this investigation.

It is not fair to the veterans of this country to say, "We will have nothing to do with the veterans until we get a commission to go out and study the whole problem, and write one of these long reports like the Wickersham report. Then after reading the fifty or sixty pages of it, we will know what kind of laws to pass." The veteran who is sick with an injury or illness arising from his service should not wait for a commission. He needs immediate attention, and the place where he ought to get that attention is in his home town from his family doctor. And the government ought to pay for it because he gave the government without asking at that time what the government would pay him.

The American Legion is concerned with the proper care of the individual soldier at the time he needs that care. That, of course, is also the concern of the American Medical Association.

As you look through the figures, you will find some remarkably interesting statements. There is one statement there by Dr. Griffith of the Veterans Bureau which says that the government pays $2.50 a day to take care of a well veteran in a soldiers' home, and $3.50 a day to take care of a sick veteran in a veterans' hospital. If there exists in the United States anywhere any hospital or any doctor who can take care of a sick man for only $1 more than it costs to take care of a well man, that is one of the greatest marvels of economy the world has ever known. That merely means that that sick man is not getting the medical care he ought to be getting because you can't do it for $1. You can't begin to give the type of medical care that a man needs for anything like that price.

It is like the fiction that is going around the country that we have to give all the people the best type of medical care for what they can afford to pay. They can't afford to pay for the best type of medical care. When they go down to the railroad station they can't all afford to pay to ride in drawing rooms and compartments. Some of them have to sit in day coaches. The same arithmetic applies wherever you try to standardize human beings and put them on a single level. You find that it cannot be done.

The Russian government thought they were going to abolish private practice. All physicians would be employees of the state and the doctor would be on exactly the same basis as anybody else. What happened in Russia? The people began to bootleg private practice. The man came around to the state doctor and said, "What is the matter with me?" The doctor told him and then said, "Your time is up. I have seventy or eighty other fellows I have to see today."

He said, "Doctor, if I could scrape together a few rubles could you see me after office hours for a little private attention?" Private attention may make the difference between cure and merely alleviation in certain types of medical cases.

The veterans are just like doctors and lawyers. There are a certain percentage of them who are likely to try to put something over on the government. There are a certain percentage of doctors who are likely to put something over on anybody who consults them, and there is a certain percentage of lawyers (I am not going to tell you exactly how many) who have to be watched a little more closely. I have been asked time and again about this particular point, and I always say that the percentage of doctors who cannot be trusted is just a little less than of ministers and lawyers.

As you read through these hearings of the Veterans' Bureau, and particularly some of the statements made by Brigadier-General Hines, Colonel Ijams and Dr. Griffith in the hearings before Congress, you hear time and time again the statement, "We can't trust those civilian doctors to see to it that the veteran is properly rated." Well, I looked through that rating book one time and they told me how long it took them to get that rating book together, that book you look through to find out how much a veteran ought to have. I am frank to say that Ely Culbertson and his wife Josephine both couldn't find anything in that book that would figure exactly right. It is difficult. I found in this book, for instance, that if a chiropractor's hands are injured he gets

more compensation than a surgeon gets if his hands are injured. All of you know how delicate a decision that must have been. It has been said about a chiropractor that he gets $5 for doing what some other man would be slapped for.

I venture to say—and I say it in all confidence because I doubt that any other person knows the doctors of this country and their complaints any better than I do—that the average mine run of doctors in this country is as good as, if not quite superior to, the mine run of doctors employed by the Veterans' Bureau at the salaries that the Veterans' Bureau is able to pay. And if I were a soldier and disabled, and I had to pick a doctor, I think I would pick my family doctor above any doctor that the Veterans' Bureau has in its entire staff. That doesn't mean to say they are not good doctors. Most are graduates of good medical colleges. They have had hospital internships. They are quite able to give a veteran good medical care, but no doctor employed by anybody, by an industry, by a government, by a university, or by any corporation of any kind, can give a man the kind of personal and private attention that he can get from his own qualified family doctor.

We must realize and the Veterans' Bureau must realize that the physicians of this country are to be trusted with the care of veterans. They must realize that there has been progress in scientific medicine since the Spanish-American war. In 1900 there were 1,000 hospitals in the United States. Today there are almost 7,000 hospitals in the United States. In 1900 less than fifteen per cent of the hospitals in the United States had X-ray departments. Today more than eighty-five per cent of the hospitals in the United States have X-ray departments. In 1900 nobody knew what a clinical laboratory was. Today seventy-five per cent of the hospitals in the United States have adequate laboratories in which a man can get everything scientific medicine can give. It is not fair or right for the Veterans' Bureau, or anyone else, to reflect on the hospitals of the United States and say that these hospitals are not capable of giving as good service as can be had in a Veterans' Bureau hospital. Any hospital properly classified as first-class by the American Medical Association, by the American College of Surgeons or by the American Hospital Association is a hospital to be trusted.

Then the Veterans' Bureau say to The American Legion, and they hope The American Legion will believe them, "We can't put soldiers in private hospitals because they don't keep records." Anybody who has tried to come up against the inspection system of the American Medical Association and the American College of Surgeons on this matter of keeping records realizes that the records kept by any hospital properly rated by those bodies today are just as good records as can be found anywhere in the world. Incidentally, there is so much keeping of records that we had better consider whether or not the cost of medical care has not been considerably multiplied by the keeping, filing, storing, and indexing of unnecessary records.

The American people are recognized throughout the world as a free, independent, and individualistic people. The civilization of the American people is a civilization founded on the maintenance of the home and of the family as the unit of that civilization. Whenever you take a man who is sick out of the bosom of his family and send him 100, 200 or 300 miles away, and keep him there day after day, week after week, and month after month, away from his wife, his children, his mother, and all of those people who are so close to him and who want to see him in the time of his illness, you are striking at the basis of our civilization. There is stimulation that comes from knowing that somebody close to you is watching you and loving you and pulling for you to get out of your illness. There are two patients side by side with a pneumonia; one of them wants to get well because his family is pulling for him and wants him to come out of it; the other has nobody to care and nothing to look forward to but a life of a few years dragged out on a government pension; one wants to get well and the other doesn't care whether he gets well or not. The doctor says, "I may be able to do something with this fellow, but the other man hasn't anything of that left in him that comes from being in the midst of his family." He has a poor chance to get through compared with the man who has everything that personality and being human can give a man.

I am not arguing from the point of view of economy. I feel with Mr. Cliff that if it costs the government every last dollar it has, it is its

duty to take care of any soldier with a service connected injury. It is its duty to take care of any soldier with a non-service connected injury if that soldier hasn't the money to be taken care of in any other way. It is the duty of our people to pay back those who went to the war and separated themselves voluntarily from their own people, who took the chance of losing their lives in order to protect the rest of the country, and who suffered serious injuries in their service. That is a duty of the government that cannot be delegated in any other way. It cannot be delegated back to the man's home town or to his state. It is a government obligation that he undertook, and it is a government obligation that must take care of him.

But I do say that the way in which he is taken care of is a matter of interest to the citizens of every state, a matter of interest to the citizens of every community. If he is taken care of in his own community he is going to be a good citizen of that community from that time on. But if he is shipped off to be taken care of somewhere else, he is no longer a citizen of his home town, no longer a member of his family, no longer a citizen of his state; he is just a ward of the government.

Do you realize that our government is developing more and more such wards? Do you know that the mental defectives are increasing in considerable numbers and have to be taken care of in institutions? Do you realize that the government is taking care of thousands of the soldiers of previous wars? Do you know that postal employees and government clerks are looking for free government care? As all of these people come back on the government taxes begin to roll up. The money moreover is taken out of the community where it ought to be left to take care of the sick in the hospitals that have been built in the community, by the doctors in the community, by the nurses in the community, by the warehouses and stores and institutions that supply the hospitals, the doctors, and the nurses. Now you realize we are getting away from local responsibility into a great centralized scheme that is likely to result disastrously for this country.

The doctors want to see to it that the veteran gets the best type of personal medical care that can be given to him. We are convinced that the people to give that to him in the majority of cases are his own family physician and the workers in the hospitals in his own community.

THE COMMUNITY HOSPITAL AND THE HOSPITALIZATION OF VETERANS*

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TONIGHT we are asked to consider the problem of the hospitalization of veterans from four aspects: (1) from the standpoint of the community hospital; (2) from the standpoint of the veteran; (3) from the standpoint of the public; (4) from the standpoint of the doctor. It seems to me feasible that a policy could be adopted which would conserve all four interests and guarantee to the sick or injured veteran the best possible service at the earliest possible moment of need, under conditions physical and mental which will promote recovery and convalescence, after efficient medical diagnosis and treatment, or surgical operation.

*Read at the annual meeting of the Minnesota State Medical Association, St. Paul, May 23, 1932.

It is my problem to state the problem from the standpoint of the community hospital—that very useful sentinel of public health widely distributed over the land. It is your local hospital. There are, I presume, two fundamental questions: (1) what helpful, even necessary service can the community service render to the veteran efficiently; (2) what reactions will the national program of hospitalization of veterans have on the public health service of the community hospital immediately, and in the long run.

Hospitalization of Veterans' Illness due to Service.—Let us see first what are the conditions of the present problem. The national government has very properly assumed the obligation to provide for the hospitalization of any one of the

four and a half million veterans who have suffered a disability due to war service, wherever that service was rendered. It adds very properly, too, disability allowance, the amount depending on the extent of the disability. With that policy there can be no dissent, but we frankly get onto debatable ground with the development of the program, and the policy that is asked for definition in legislation now before Congress.

Opening Up Hospitals to Nonservice-Connected Cases.—In 1924 the situation had developed to such an extent that the veterans with service-caused disabilities did not occupy all the beds in the veterans' hospitals. In other words, by this time the government had provided sufficient hospital facilities for all cases of service origin, and there were a small number of vacant beds in Federal hospitals of the three types, psychiatric, tuberculous, and general. A policy of special consideration for the veteran was made to President Coolidge and accepted, which proposed that whenever there were beds available in the veterans' hospital, veterans whose disabilities were not caused by military service could use them. This was too reasonable a policy, particularly as the exact cause of physical disabilities might in some cases be difficult of determination as to its military origin. But the demand of these beds became great, and the Veterans' Bureau introduced a principle which the representative of the veterans' organization said was like waving a red flag in their faces. This principle was that these empty beds were made available to veterans who could least afford to pay for the hospitalization. Thus the principle of charity was introduced.

Hospital Service to Veterans Mandatory.—This step was followed by the authorization of an increased hospital building program. This was seen to be a tacit though not an explicit acceptance by Congress of a new policy, urged by veterans' organizations, namely, that the veteran as a matter of right and not of charity is entitled to hospitalization including medical and all supplementary service for all sickness or disability, whether its cause was due to the military service or not. This applies also to veterans of all wars. In this, as it has been very properly said, the benefits are based not on the veterans' *service,* nor his *need,* but on his *status.* The policy under discussion, therefore, is the right of the veteran as a veteran to hospitalization, including medical service for whatever illness or injury or other disability, whatever its nature or origin. This is a free national health and medical service to the four and a half million veterans as a national appreciation for a national service.

Classification of Cases.—This is the general development of the policy with reference to the hospitalization of veterans, from the care of veterans for disabilities originating in his military service, to his care for any disability whatever its nature or origin. But our problem will not be revealed until we classify the hospital cases of veterans. For the purposes of legislation or administration, the hospital cases are classified into three groups: (1) the neuropsychiatric; (2) the tuberculous; (3) the surgical and medical.

The Facts About Character of Cases of Hospital Load.—The general situation with reference to these three principal types of cases whose disability was of service origin, indeed as well as the rapidly increasing proportion of non-service connected cases is:

The tuberculous cases of service-connected admissions have decreased from 19,791 in 1925, and 14,166 in 1926, to 4,879 in 1931. On the other hand, the nonservice-connected cases have increased from 10 per cent of the admissions to over 55 per cent.

The neuropsychiatric cases of service-connected admissions have declined from 12,556 in 1925 to 6,681 in 1931. On the other hand, the neuropsychiatric cases of nonservice-origin has increased from 17 to 58 per cent.

The general cases of service-connected admission have declined from 31,222 to 13,058. On the other hand, the general cases of nonservice-origin have increased from 20 to over 83 per cent of the total.

Not Concerned with Neuropsychiatric and Tubercular Cases. It is conceded for the present that the neuropsychiatric and tuberculous cases of veterans might properly be cared for in veterans' federally-administered hospitals, though it might be suggested that if this is the policy, and it will undoubtedly involve added federal hospital facilities, this should be located and distributed so that in the absence of war in the next generation, these facilities might be made a part under proper auspices (not the Federal government) for the care of the civilian population.

Acute General Cases: Our Problem.—In the general cases, particularly of nonservice origin, or in the general cases of service origin, the Vet-

eran Administration may now select civilian hospitals for such care. But if and when the non-service-connected general cases are mandatory upon the Veterans' Administration, it is urged that this same discretion be lodged in the Veterans' Administration for the nonservice-connected general cases.

The Background of Facts of General Cases.—The United States has spent over $150,000,000 for hospital construction and equipment. It made an appropriation of $21,000,000 last year. It is estimated that from $50,000,000 to $75,000,000 will be needed in the next twenty-five years for the construction and replacement of hospitals for general medical and surgical cases.

It is estimated that there will be need of only 25,786 beds for general cases, of the approximately 60,000 needed. This number will rise to 37,718 of the 81,459 beds needed. The estimate of the Medical Council for 1950 is 67,371 general cases, but the difference will be taken care of in the domiciliary facilities of the Soldiers' Home. These figures are given in terms of beds needed. It should be clear that the number of admissions in each year will go into the hundred thousands.

The number of patients whose disability is nonservice-connected may be indicated. At present 60 per cent of cases of tuberculosis, 33 per cent of neuropsychiatric cases, and 83 per cent of the general are non-service-connected cases. In some of the hospitals this last figure runs now to 88 per cent non service-connected. The statistics show a rapidly increasing proportion of non-service-connected cases.

The Special Problem.—Such is the situation as the statistics can present it. The problem I am asked to present to you for your consideration is the part the civilian and local hospitals can play in this program to take care of the hundred thousand veteran-patients annually suffering from nonservice or service disabilities, for whom the national government must provide. (It is said that 350,000 total hospital admissions for acute cases among veterans in 1931 may be taken as a minimum.)

The Specific Proposal.—The proposal in the interest of the veteran as well as the community hospital is that in emergency cases of the acute general type, the approved community hospitals may be used. These community hospitals may now be used for service-connected cases. Why not for nonservice-connected cases? These are the very hospitals these men and women would select ordinarily if there had been no extension of Federal hospitalization to the non service-connected cases. They are capable of rendering an adequate service to the civilian population, why not to that civilian population which is made up of former soldiers?

The Case for the Community Hospital.—The case for the care of veterans in civilian hospitals for those who are to receive hospitalization for disabilities or illness, whatever its nature or origin, is put quite effectively in the resolution of the American Hospital Association. This resolution points out that the use of community hospitals for the "diagnosis and treatment of injuries and illnesses will often prove advantageous to both patient and Nation," because of the following points:

"(a) The veteran may receive in an approved civilian hospital in his neighborhood the opportunity enjoyed by his fellow citizens for immediate treatment in the event of accident or acute illness without the necessity and danger of halting treatment for removal to the nearest government hospital;

(b) If referred to a civilian hospital the patient would not be subjected to separation from family, friends, and business environment during the period of illness and incapacity, as well as in the event of death, as would often result from reference to a government hospital;

(c) After the acute stage of illness he will not be required to remain at the hospital for necessary convalescent observation, prescription and care, instead of returning to his home thus eliminating additional distress to himself and additional cost to the nation;

(d) The patient will not be subjected to the dangers and delays of transportation; and the cost thereof to the nation will be avoided;

(e) The patient will be afforded opportunities for special and consultive professional care through the facilities provided by many of the large civilian hospitals which may be found in his neighborhood;

(f) The cost of maintenance and professional care in civilian hospitals should not exceed that of governmental hospitals, and the cost of construction and equipment of many large government hospitals, the need of which will gradually disappear in the course of time, will be avoided."

The Special Problem of Community Hospitals in Times of Depression.—There is a special problem in these days of depression that should be determined, but might very well be taken into account apart from the more fundamental considerations in determining the immediate policy of the national government with reference to the building of hospitals for the care of general cases. This special situation is the greatly reduced patronage of the ordinary civilian hospital, the financial difficulties that face them, and the possibility of a deterioration in service to the civilian with its ultimate bad effects on the general public health problem, at least so far as it is helped through hospitals. During the years 1930 and 1931, the equivalent of thirty-four beds out of every 100 beds in every civilian hospital in the United States stood vacant every day. The Federal government might materially aid this situation by providing under regulations for the care of emergency, medical and surgical cases of veterans in civilian hospitals, this stimulus to these local hospitals that may be the decisive factors in many communities in maintaining its public health service. At any rate, in these times it will be a great help. In any case it would seem to be wise that the utilization of these resources is the wisest economy from any point of view.

The Federal Octopus.—There is perhaps an even more fundamental question than any one that has been raised. We see the building up of an immense hospitalization service to four and a half millions of veterans of wars with a corresponding hospital building program. Unless we are assuming more wars, what is ultimately to happen to these buildings and this personnel? Will the old centralization disease, cancer-like, get a hold of us here in this beneficent work for veterans? Will the old Federal octopus with its bureaucratic tentacles try to justify itself and force upon us problems not of state medicine but of Federal medicine and Federal hospitalization? It may seem far-fetched and unreal, but all you have to do is to look over into the field of education to see what innocent and beneficent beginnings may do in the development of Federal power, Federal machinery, and Federal policy. Since innocent and beneficent Federal land grants became the basis of the immense education propaganda, why not beneficent service to veterans —"service disability," then for any disabilities, then why not for their families, and why not use existing facilities for the general population? I leave that thought.

Conclusion: Two Fundamental Outlooks.—I have presented to you the foregoing statistics of present services and probable needs, an analysis of the elements in the problems, and some suggestions growing out of these figures and analyses for the hospitalization of veterans in acute general cases in the community hospitals. The fundamental outlooks, implicit, though not formally stated, are: (1) that if the Federal government can in this case secure all the objects aimed at by the veteran legislation, and at the same time build up and reinforce community hospitals upon which localities depend for an essential health service, it should do so; (2) that there should go into a program involving so much money, affecting so many people, potentially dangerous or helpful to the community hospitals, constructive and intelligent planning to consider the whole problem including the welfare of civilians, particularly in view of the fact that the conditions will pass with time unless there are other wars. To your judgment I leave the problem, confident of your conception of the welfare of the whole people.

THE ZIFFERBLATT HAY FEVER TREATMENT

In May, a Philadelphia newspaper published an article with the headlines: "Hay Fever Stayed by Discovery Here. New Inhalant Immunizing Patient to Ravages of Disease Announced." The article opened with the statement that Philadelphia, long noted as a center of medical science, had added another triumph to her achivements by the discovery by one of her research workers, Dr. Arnold H. Zifferblatt, of "a 100 per cent successful treatment for hay and grass fever." Summed up, the situation seems to be: that Dr. Zifferblatt and his associates claim to have developed a treatment for hay fever that will give permanent relief for the season; (2) that no information regarding this treatment has been published in medical literature, but the widest publicity has been given it through the daily press; (3) that the composition of the drugs used and the methods of administering them are admittedly secret; (4) that at least a proportion of the public is being charged for this secret treatment, which is admittedly in the experimental stage. (Jour. A. M. A., July 16, 1932, p. 227.)

FRACTURES IN AND ABOUT THE NECK OF THE FEMUR*

WILLIS C. CAMPBELL, M.D.
Memphis, Tennessee

IN fractures in the upper extremity of the femur involving the region of the neck there seems to be much confusion, as is apparent in the literature from articles by experienced surgeons who should possess a clearer knowledge of the subject. Not infrequently is seen in the same group a report of end-results of fractures in several different locations in which there is a vast difference, from a clinical, mechanical and physiological standpoint. In consequence there is less appreciation of the subject by the profession at large. This is often quite apparent when one hears a statement made by a physician that he employs some simple method of treatment of a case of fracture of the neck of the femur, and union was obtained in a short space of time, and walking resumed after two months. When this physician is closely questioned as to the exact location it is too often evident that he does not possess the slightest knowledge as to the behavior of fractures of this region. It is thus obviously essential that differentiation be made as to the exact site of the fracture in this region as the variation of a fraction of an inch may make a vast difference as to prognosis.

Various descriptions and classifications have been made, which are more or less confusing to the student. From these the following have been selected for this discussion:

1. Capital
2. Central { Complete / Impacted
3. Lateral
4. Intertrochanteric
5. Peritrochanteric
6. Subtrochanteric

Capital fractures are very rare and are due to direct violence which transmits force from the trochanter or shaft to the head causing more or less comminution with often sequestration.

Complete central or transcervical fractures are those which occur in the narrow portion of the head, and are usually entirely within the capsule of the joint though occasionally may extend a short distance beyond. When close to the head they are described as subcapital, though such a minute subdivision merely adds to confusion. They may be oblique or transverse. In an analysis of roentgenograms of 106 fresh fractures there were apparently 50 per cent oblique and 50 per cent transverse. The oblique type begins just external to the head on the superior aspect and extends downward and outward to about the junction of the middle and outer third of the neck. The transverse type extends at right angles across the neck, but are always irregular or digitated, never a square clean-cut severance as observed in the shaft of the femur. In this region there is rarely, if ever, any comminution as evidenced by loose fragments.

Impacted central fractures are those in which there is more or less telescoping of the distal into the proximal fragment with more or less rotation of the head or proximal fragment. Distinction must be made in those in which the fragments are merely engaged and those that are actually impacted. Some authorities do not recognize, from a scientific standpoint, the existence of this type, but fracture of the neck of the femur undoubtedly occurs in which the fragments are so closely attached that movements of the head within the joint may be made without eliciting motion at the site of fracture. And also the clinical course of this type is so different from those in which there has been complete severance that a special consideration is demanded.

Lateral fractures are those through the outer third of the neck of the femur and are transverse, being rather clean cut as if made by a saw. The anterior extremity of the fracture is within the capsule while the posterior extremity is extra-capsular, as the capsule does not extend over the entire posterior surface of the neck. They are so close to the trochanters that it is doubtful whether a separate classification is justifiable. Lateral fractures are more common in children than central fractures.

Intertrochanteric fractures are those which extend between the trochanters, but do not involve the trochanters materially. This fracture is more

*Presented before the annual meeting of the Minnesota State Medical Association, Saint Paul, May 24, 1932.

or less clean-cut and might also be described as fracture of the base of the neck, and, as in other types to be described below, is entirely extra-capsular.

Peritrochanteric are those which pass through

The old classification of intra-capsular and extra-capsular, though subject to some objections, gave a practical clinical knowledge of the subject, as it was then thought that those within the capsule did not unite by bone, while those exter-

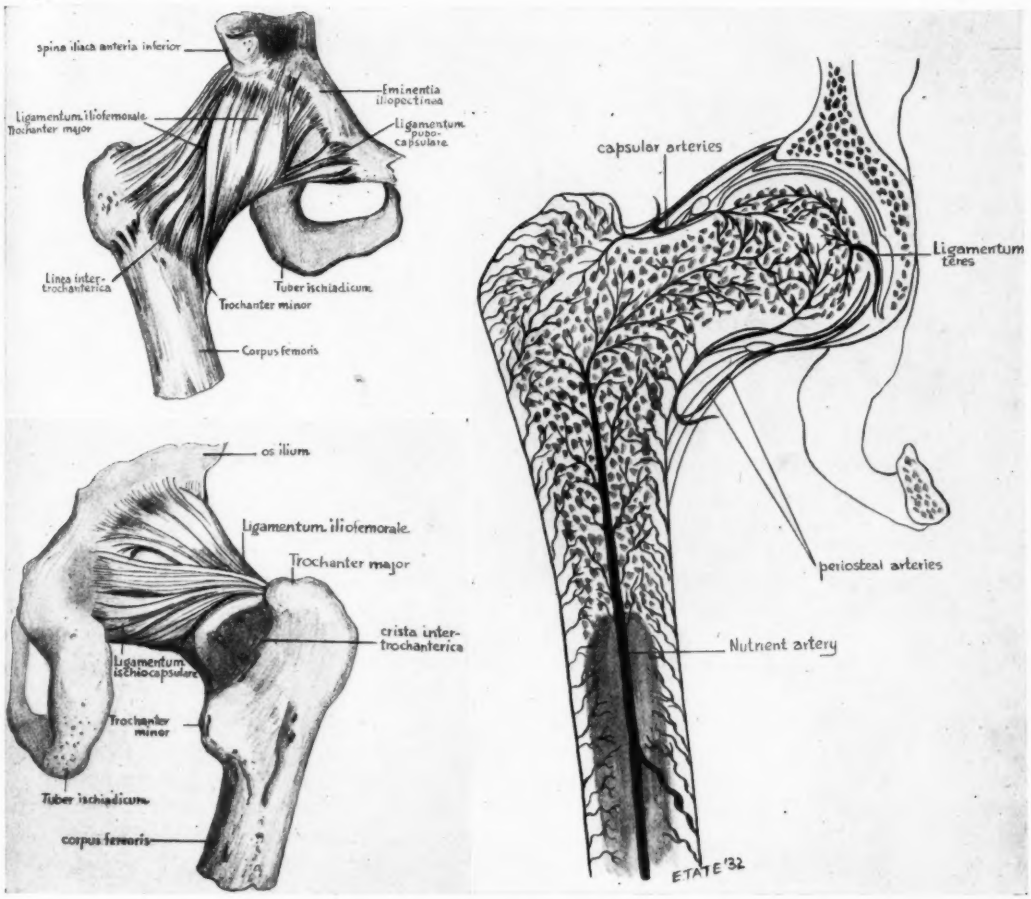

Fig. 1 *(upper left)*. Drawing of hip showing ligaments, anterior view, ligamentum iliofemorale or Y-ligament.
Fig. 2 *(lower left)*. Drawing of hip, showing ligaments, posterior view, ligamentum ischiocapsulare, or ischiofemoral. This also shows considerable portion of the posterior aspect of the neck extracapsular.
Fig. 3 *(right)*. Schematic drawing showing circulation to head and neck of femur.

both trochanters, usually breaking loose entirely the lesser trochanter, which is often displaced internally. These are more frequent than others of the trochanter and there is always much comminution.

Subtrochanteric fractures occur below both trochanters and are in reality fractures of the shaft of the femur and are not pertinent to this subject.

nal thereto unite without difficulty. Another classification which is even better is: cervical and trochanteric. The cervical fractures are those which occur within the neck proper, while the trochanteric fractures are those which occur in the region of the trochanters.

A thorough knowledge of the exact location of the fracture in question is most important for those in the region of the trochanters always

unite by osseous union within from four to six weeks and present only a mechanical problem; whereas, central or intracapsular fractures unite slowly or fail to unite and are not only a mechanical but also a physiological problem as will later be demonstrated.

Differential diagnosis as to the exact location cannot be uniformly made without an X-ray, and to determine the exact relation of the fragments, stereoscopic roentgenograms are required. In all, the position of external rotation with elevation of the trochanter is usual, but there is much more pain in trochanteric fractures than those within the neck proper, and crepitation is more marked.

Fig. 4 *(left)*. Sagittal section of femur showing arrangement of bony trabeculæ.
Fig. 5 *(center)*. Femur from which greater and lesser trochanters have been removed, forming a mechanical crane.
Fig. 6 *(right)*. Roentgenogram of femur showing arrangement of bony trabeculæ, with the formation of Ward's triangle.

The important factors of anatomy and physiology of this region which are of practical value will first be discussed briefly. In the normal adult the neck of the femur forms an angle of about 125° with the shaft. In the aged this angle is often decreased and may at times be as low as 115°. The weight of the body transmitted through the neck to the shaft is thus placed on an oblique or curved axis, which, like the axis of a wheel, is mechanically efficient until impaired. The neck is also deviated forward at the junction with the shaft, forming an angle in the anterior-posterior plane of about 15°. The head of the femur and the acetabulum are thus on a plane anterior to the shaft and to the trochanters. Consequently, if a bullet enter the femur perpendicularly to the center of the greater trochanter it would pass below and posterior to the head of the femur, but if deflected upward at an angle of 125° and forward 15° the bullet would pass through the center of the femoral head.

If the greater and lesser trochanters are removed, the femur is seen to form a tubular curved lever, and according to Meyer and Cullman the trabeculæ of bone are arranged in the same manner as the trajectories of stress of a crane, being produced along the lines of tension and pressure. The pressure trajectories pass from the inner aspect of the shaft parallel with the inferior border of the neck into the head; the trabeculæ of tension pass from the external portion of the shaft parallel with the superior border. These cross each other at an acute angle of about 45° just distal to the head. Wolff applied this principle to other bones and organs of the body and developed his famous law of functional adaptation. Murk Jansen, of Holland, disputed this theory and pointed out that such lines are not analogous with the trajectories of a crane, since the trabeculæ in the neck of the femur cross each other at an acute angle, whereas, the trajectories of the crane cross each other at a right angle. Jansen believes that these lines are due entirely to forces of pressure and that tension has no material influence. Be that as it may, whether caused by pressure and tension or by pressure alone, this arrangement of the trabeculæ is constant and has a practical application to the subject. As these lines cross in the neck of the

femur a triangle is formed in which there is less bone, producing a weak area which was described by Ward in 1838, and is known as Ward's triangle.

The hip joint is supported by powerful ligaments and muscles. The articular capsule is attached medially about the rim of the acetabulum, slightly nearer the rim below and posteriorly than it is above and anteriorly. At the femur the capsule is fixed anteriorly to the anterior portion of the greater trochanter, along the anterior intertrochanteric line, inferiorly on a level with the lesser trochanter, and posteriorly along the base of the neck of the femur above the posterior intertrochanteric line but leaving a space of about three-fourths inch extra-capsular. The thickness and strength of the capsule vary in different regions, there being three sets of auxiliary fibers, only two of which are of sufficient importance to be considered, *i.e.*, the ilio-femoral and ischio-femoral. The ilio-femoral or Y ligament of Bigelow is the strongest ligament in the body; it is attached above to the ilium immediately below and behind the anterior inferior spine and is inserted into the greater trochanter and into the anterior intertrochanteric and spiral lines as far as the medial border of the shaft of the femur. The ischio-femoral band arises from the ischium between the lesser sciatic notch and the obturator foramen and is inserted into the greater trochanter in front of the insertions of the pyriformis tendon and to the superior and posterior parts of the neck of the femur. The anatomy of the muscles of this region is well known, and requires no description, except to mention the powerful external rotators which play a definite role in these fractures. The gemelli and obturator intermus rotate the head of the femur backward after fracture. The psoas magnus and iliacus muscles pass over the neck of the femur and have been accused of being caught between the fragments in central fractures, although the probability of this is doubtful.

Fig. 7. Central or intracapsular fracture of the neck of the femur.

Fig. 8. Same as Figure 7. Solid osseous union. The head of the femur is living, as denoted by the structure being of the same density as the surrounding bone in the ilium and distal fragment. Also note physiological rearrangement of bone trabeculæ from change in direction of weight-bearing.

As an adequate blood supply is the most important factor in the production of callus, familiarity with the circulation is necessary to a thorough knowledge of the process of healing. According to Kolodny there are four sets of blood vessels to the head and neck of the femur:

1. Those from the shaft which enter from the superior nutrient artery and pass through the

neck to the head, although only a small number penetrate to the epiphysis.

2. Periosteal, which pass superficially along the borders of the neck into the head. As the existence of periosteum on the neck of the femur is disputed, these vessels should probably

Fig. 9. Fracture of the neck of the femur two months after reduction, showing increased density of the head as compared to that of the trochanter, indicating probable aseptic necrosis.

Fig. 10. Solid osseous union with mottling of the head, showing probable gradual substitution of a dead head by new bone.

be called synovial as they must pass in the deep layers of the synovial membrane which is reflected over the neck.

3. Epiphyseal, which pass to the epiphysis from the capsule below and the subdigital fossa above.

4. Those from the ligament teres which enter the head at the depressed area known as the fovea. After a complete fracture this vessel is the sole source of blood supply to the head of the femur until collateral circulation is reestablished, as all other vessels are severed.

When fracture occurs the limb or outer fragment is rotated outward and displaced upward. Outward rotation is produced by three forces: (1) the reflex contracture of the powerful abductors and external rotator muscles; (2) by the ischio-femoral ligament which is made tense as the fragments separate; and (3) by the force of gravity which is influenced by the angle of attachment of the foot to the leg. The distal fragment which is the shaft of the femur is displaced upward by the gluteal muscles, being completely separated from the proximal fragment or head. The head is usually rotated backward by the abturator internus and gemelli. In trochanteric fractures external rotation of the distal fragment is largely due to the force of gravity alone, and thus there is less rotation of the proximal fragment.

Of 304 fractures of the region of the neck, 157 were central or within the neck proper, and 147 were trochanteric. The incidence of occurrence is 51.7 per cent central and 48.3 per cen trochanteric. The average age of occurrence of central fractures was 64.1 per cent, and of trochanteric 64.2 per cent. The average age incidence is, therefore, apparently the same, but trochanteric fractures are of much more frequent occurrence in young adults, whereas, central fractures are quite rare. If we consider the occurrence above the age of 60 years, of 148 fractures in this region, there were 47 central fractures and 101 trochanteric fractures, the average ages being trochanteric 74 years, and central fractures 72 years. Fractures in the region of the trochant-

ers are over 100 per cent, therefore, more frequent than central fractures in the aged.

Later fractures of the neck, intertrochanteric and peritrochanteric, give infinitely better results than those within the neck. With any form of treatment, however, much better function can be secured if anatomical relations are maintained. Some form of traction should be employed, otherwise it is impossible to maintain the angle between the neck and the trochanter, and coxa vara or decrease in the angle will result with more or less permanent disability. Also there is a marked tendency to external rotation unless prevented by mechanical apparatus. The author follows routinely the following technic:

The patient is placed upon a fracture table with the limb in moderate abduction with slight internal rotation. Traction is then made until perfect reduction is secured, confirmed by a roentgenogram. Adhesive strips, as for Buck's extension of the hip, are applied, and finally a plaster cast from the nipple line to just above the ankle on the affected side. The patient is then placed in bed with weight and pulley traction of about 20 to 30 pounds, so arranged that the position of the patient can be changed. This is accomplished by having a pulley in the usual position at the foot of the bed and one at a higher level which permits the turning of the patient upon the side.

At the end of three or four weeks the cast is removed, and union is found to be so firm that no motion can be detected between the fragments. This is due to the fact that there is abundant blood supply to all fragments, and there is excessive comminution which gives extensive raw osseous surfaces conducive to hallus production, and also the fracture involves cavernous bone which is rich in osteogenic properties. A second cast is then applied from toes to nipple line, with a joint inserted at the knee to permit active and passive movements. At the end of six to eight weeks the cast is removed. Walking on crutches is permitted at the end of ten weeks, and gradual increase in weight bearing in three months, after which crutches are discarded as soon as feasible in the individual case. The after-care is essential to prevent angulation from early weight bearing.

In the very aged or debilitated the cast may

Fig. 11. Fresh fracture of the neck of the femur in patient, age fifty.

Fig. 12. Same as Fig. 11, two years and three months after operation. Solid osseous union in a dead head in which there was sequestration and flattening of the upper portion of the head.

be removed at the end of three or four weeks when a simple brace is applied to prevent external rotation and the patient is placed in a rolling chair. In these it is not always possible to prevent slight angulation and external rotation, but as union always occurs there will be good function, and the mortality will naturally be decreased.

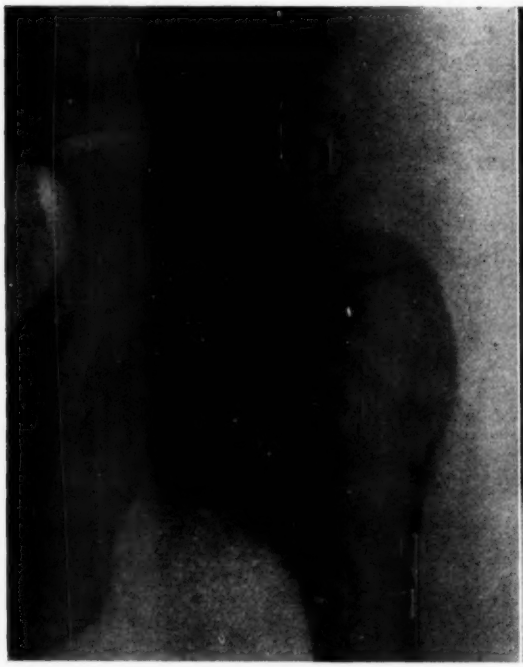

Fig. 13. Ununited fracture of the neck of the femur. Density of the structure of the head as compared to that of the trochanter indicates that head is probably dead.

Fig. 14. Fracture of the neck of the femur five years after bone graft operation in which dead head has been entirely restored to normal bone by gradual substitution.

No estimate has been made of the end results in fractures in the region of the trochanters, but undoubtedly there are many in which decrease in angle, coxa vara, decrease in length and external rotation causes a marked limp and impairs function of the hip joints. In those inefficiently treated the deformity may be so great as to render walking without crutches impossible. In those treated by any method of efficient traction, practically perfect function should be secured.

In complete central fractures the same physiological conditions prevail as in all fractures but there are many additional factors which may impair the evolutionary process of healing which may be summarized as follows:

1. As age advances there are certain physiological changes in all tissues. The evolutionary changes in bone impair regeneration of bone, cause depression of the angle of the neck of the femur, bone atrophy and impaired circulation.

2. Inefficient reduction, fixation and protective after-treatment impair osseous union and definitely induce in a short period of time a status of non-union.

3. The circulation to the head of the femur is diminished. The lumen of the vessels of the ligamentum teres is usually diminished or obliterated.

4. Weight bearing of the body is transmitted on a more or less transverse plane through the site of fracture.

5. Any movement causes a shearing action at the point of fracture which is always conducive to the organization of bone on the surface of the fragments and not across the line of fracture.

6. The normal process of union is impaired, as callus is derived chiefly from the distal fragment. All callus is intermediary, there being no reaction on the part of the periosteum, since there is no periosteum on the femoral neck.

7. Union is always delayed when compared to other fractures and a permanent status of non-union occurs in those not reduced in approximately 30 days.

8. Functional use before nature has had sufficient time to firmly consolidate new bone, impairs or may even cause disintegration of the reparative process.

9. Synovial fluid has a possible deleterious action upon callus production.

10. The head is a terminal fragment in which union often fails elsewhere in the body regardless of age, for example, in fractures of the external condyle of the humerus.

11. The blood clot which is essential to early bone regeneration is said to be deficient in this fracture.

12. The physiological reparative process differs from that of other fractures to such a degree that it may be regarded as pathological. This is chiefly in the behavior of the head or proximal fragment. In the opinion of Sir Astley Cooper the head always becomes necrotic and does not unite by bone. Axhausen and Bonn at the present time also contend that the head becomes necrotic. However, Santos has made an exhaustive investigation as to the reaction of the head which explains more clearly the pathology. These changes deducted from the investigations of Santos may be enumerated as follows:

The head may remain alive as indicated by roentgenological examination which demonstrates that the bone structures may become atrophic to the same degree as the surrounding bone in the ilium and the trochanters, or the head may die and become a sequestrum as demonstrated by the structure of the bone remaining the same as at the time of death or fracture. The sequestered head, therefore, remains much more opaque or dense, standing out in marked contrast to the surrounding atrophic tissue.

Microscopic examination of the living head demonstrates atrophic changes; the trabeculæ become thinner and the marrow spaces are increased in size and substituted by fat. The articular cartilage becomes thinner and the subchondral marrow spaces may so enlarge that the encrusting cartilage sinks below the surface, thus causing irregularity of contour in the head. Microscopical examination of the necrotic head demonstrates the usual characteristics of dead bone, in that the lacunæ are empty and the staining quality of the cells present is impaired. Fibrous tissue invades from the fovea which is probably instigated by the vessels of the ligamentum teres. New bone is formed by this tissue until the entire head or any portion thereof is restored to living bone. The articular cartilage dies, undergoing fibrillation and is exfoliated and absorbed. Adhesions from between the head and acetabulum from which there may be further invasion by fibrous tissue which becomes converted into bone.

When the living head unites, the structure of the bone is gradually restored to normal in the same manner as the surrounding osseous tissue, as function is increased. When the living head fails to unite there is gradual atrophy until only a small portion may remain. When the dead head unites, the entire head will be gradually invaded by new bone from the fovea and from the distal fragment or a portion may be extruded as a sequestrum into the joint. Thus the globular contour of the head may become more or less incongruous. When the dead head does not unite the size becomes diminished by a process of erosion and is usually invaded by new bone until the entire structure is restored, after which the density and appearance are the same as that of the living head and the surrounding living tissue.

A careful review of the roentgenograms in 126 cases have been made to estimate the reaction of the head after complete central fractures. In 108 the head remained living, and in 18 the head was dead. In those in which the non-union had existed for a long period of time it was impossible to estimate the behavior of the head as many of the dead heads are restored to normal bone by a process of substitution as above described and, in consequence, are identical with those which have remained alive from the time of the fracture. In impacted fracture the head, in all cases, remains alive as the circulation is not completely severed.

In most fractures the degree of union can be determined much earlier by physical examination but in complete fractures of the neck of the femur it is both difficult and unsafe to attempt to ascertain osseous fusion in this manner. The roentgenogram, however, is our efficient guide and the significant factors determining union may be enumerated as follows:

1. Relation of the fragments as denoted by the status of the angle of the neck after reduction as demonstrated in the antero-posterior view, and also the position of the proximal fragment or head which can only be determined by stereoscopic roentgenograms. If there is no change in these relations by the end of four months the indications are favorable to union, but this does not imply that union is certain. If there is a change in relations, as denoted by a decrease in the angle or change in rotation, union is doubtful but not uncertain so long as there is close approximation. Decrease in the angle with separation of fragments indicates almost inevitable non-union, which may be apparent as early as eight weeks. In those in which there has been no approximation, the status of non-union exists at the end of four weeks. Although it has been proven that union may be secured by simple approximation even at a later date, the chances are small.

2. Condensation of bone on the raw surfaces of the fragments indicates delayed union, and if associated with separation of fragments, non-union.

3. The structural changes when union is progressing satisfactorily is that there is no apparent external callus and there is the gradual formation of the new osseous lines of stress across the area of fracture which is rarely perceptible until the lapse of four months, and not well developed until the end of six months, and in some instances even much later. The arrangements of the new trabeculæ are never the same as normal, for, regardless of the accuracy of reduction there is always some change in the relation of the fragments as a result of absorption of the surfaces of the bony fragments. These new lines invariably begin just external to the lesser trochanter and pass directly upward through the head to its superior aspect and the upper wall of the acetabulum. Ward's triangle is thus entirely obliterated and replaced by new bone. In those in which there has been condensation along the line of fracture, the process of union is more delayed as in fractures elsewhere in the skeleton, and the physiological lines of stress are not apparent until a much later time.

The progress of union is determined, therefore, during the first four months by the anatomical relation of the fragments. After four months the progress is determined by both the anatomical relation of the fragments and the structural changes as above described. In a very high percentage, six months or more will elapse before union can be determined. The conclusion that union has occurred prior to six months is too frequently made, which leads to false security and often non-union by improper care.

When the head is living, union takes place in less time than when the head is dead, other conditions as age and structural quality being equal. In a dead head, in addition to union, there must be also substitution of the entire head by new bone, which may require many months.

Many methods have been employed in the treatment of fractures of the neck of the femur, operative and non-operative or conservative. The exponents of the operative methods claim that on account of rotation of the head, satisfactory approximation and fixation is improbable, and also with internal fixation earlier function is permissible. The object of all open operations is to transfix the head and neck of the femur by nails, screws, ivory pegs, beef bone, etc. These are inserted from without inward below the trochanter through the neck into the head of the femur. The results from these methods have not been uniformly satisfactory, nor has there been a sufficiently large number of cases reported by a sufficient number of surgeons to cause a general adoption of any of these procedures. The author has employed open methods in approximately six cases of recent fractures. In three the beef bone peg was employed, with one successful result and two failures. In two, steel nails were employed without success. In one, an autogenous bone graft from the tibia was used with excellent result. The excellent results in these two cannot be attributed solely to the open method as the abduction treatment was also employed. It is probable that if any open operation is indicated the autogenous graft gives the best chance of success, as no foreign material is inserted and the graft is osteogenetic.

Recently Smith-Petersen, of Boston, has devised a three flanged nail which is most ingenious, as it prevents rotation of the head, and more firmly fixes and approximates the fragments than any of the methods above mentioned. In order to secure satisfactory reduction he states that the hip-joint must be widely exposed.

His results in a small number of cases at varying ages have been encouraging, but the end results in a large number of cases with different surgeons must be reported before the real value of this method can be estimated.

The conservative methods in which osseous union has been secured are the Ruth, Maxwell, Bardenheuer and the Whitman abduction methods. The Ruth, Maxwell, and Bardenheuer methods maintain reduction by means of traction to which reference can be made. The method of treatment which is more generally accepted and which I have routinely employed is the abduction treatment, which consists in abduction to the limit, which is 135°, complete extension and moderate internal rotation. In this position a plaster cast is applied extending from the toes on affected side to nipple line, and down to just above knee on normal side. As an adjunct to the abduction treatment, artificial impaction, as advocated by Cotton, has also been employed in a number of cases. A careful routine after-treatment is essential and must be adjusted to the conditions found in each case. At the end of eight weeks the cast is removed and roentgenograms made. Almost invariably the roentgenograms will show at this time that the position of reduction has been maintained. A second cast is applied from toes to nipple line in the same position but omitting the cast on the unaffected side. A steel lock joint is placed at the knee joint in the second cast so that active and passive motion may be given to the knee, but at other times the joint remains locked to continue complete fixation. At the end of the third month this cast is removed and an abduction hip brace applied, with lock joint at the knee and the joint made immovable at the hip. During the fourth month the patient is permitted to be lifted into a rolling chair. At the end of the fourth month the joint at the hip is unlocked and the patient permitted to sit up in bed and in a rolling chair. At the end of five months the patient is permitted to walk with the aid of crutches and wearing the protective brace on which most of the weight is borne on a Thomas ring. Roentgenograms are made from time to time to determine the degree of union and protection is gradually discarded as union progresses. Not until the new trabeculæ have passed across the line of fracture is apparatus discontinued.

As soon as the patient has recovered from the acute symptoms of the fracture, muscular exercises are begun which consist of contracting the muscles of the thigh and leg with especial attention to the quadriceps muscle. Gentle passive and active movements are instigated in the knee at the end of eight weeks and are gradually increased after the brace is applied. Physiotherapy is given to the hip and thigh muscles when the second cast is removed and the brace is applied, but not until the end of the fourth or fifth month is movement permitted in the hip-joint and this is commensurate with the degree of union. In most instances the brace is discarded by the end of eight months, but in those with delayed union protection has been continued for as long as eighteen months. In the average case one year is required before the patient can assume the same duties as at the time of fracture, although much, of course, depends upon the status of the individual.

A clinical examination is carefully made when the first cast is removed and subsequently at thirty or sixty day intervals. Not until the end of the fourth month is the hip freely moved and then no force is used. Dependence must be placed chiefly upon the roentgenogram. As bone atrophy is decreased and the structures return to normal, function is increased. The degree of union cannot be determined with safety by manual examination until the elapse of six or eight months. Non-union, however, can often be determined at a much earlier date by the roentgenogram and symptoms of pain, especially in the muscles of the thigh, and instability, crepitation and pain on movement at the point of non-union.

Impacted fractures require fixation only by splint or apparatus and unite at a much earlier date. Apparatus may usually be discarded at the end of three months, but fixation and protection is required in these as complete fractures have been caused by too early weight bearing, and a comparatively simple condition converted into one much more serious. Numerous malpractice suits have arisen in such cases when the fracture was unrecognized and no roentgenogram was made at the time of fracture, with the result that there was subsequent separation of fragments on persistent weight bearing. In consequence, no injury of the hip in any individual over the age of forty should be viewed lightly,

and in all cases a roentgenogram should not only be suggested but demanded. All impacted fractures of the neck of the femur unite if protected a sufficient length of time, unless death ensues from some complicating disorder.

The main objection to the abduction or any other closed method of treatment is the necessarily prolonged confinement, but this is apparently required by nature, and until some method can be devised that will hasten the reparative local process so that osseous union will be secured in a shorter space of time, and also increase the percentage in which union occurs, no further improvement can be expected. Prior to the abduction treatment the possibility of osseous union was generally doubted. In consequence, from the number of cases in which osseous union with excellent function has been proven beyond the shadow of a doubt, it must be admitted that a material advance has been made.

Statistics as to results of complete central fractures of the neck of the femur vary to a considerable degree, and at present pessimism prevails with quite a number of surgeons which is probably due to the fact that the necessarily prolonged fixation without weight bearing as described above is not always employed. Estimation of true end results are secured with great difficulty, and fallacies may arise even under the most careful supervision, as has been my personal experience. This is largely due to the difficulty of following each case closely with successive roentgenograms and physical examination for a period of at least eighteen months to two years. In this report only those in which such a record could be most accurately secured over a period of two years or more are considered. In consequence quite a number have been discarded.

In impacted central fractures and in those in the region of the trochanters the results may be determined in a much shorter period of time.

The following tables demonstrates end results and important factors of fractures in and about the neck of the femur.

TYPE OF CENTRAL FRACTURES

Transverse	48
Oblique	52
Dentate	6

CENTRAL FRACTURES OVER 60; LIVING CASES

Solid union	19
Doubtful union	5
Fibrous union; good function	5
Non-union	18
Total	47

IMPACTED FRACTURES OF NECK; LIVING CASES

Solid union	25
Doubtful union	0
Fibrous union; good function	0
Non-union	0
Total	25

CENTRAL FRACTURES UNDER 60; LIVING CASES

Solid union	21
Doubtful union	0
Fibrous union; good function	0
Non-union	6
Total	27

CENTRAL FRACTURES UNDER 60

Total	54
Average age	48.3 years

CENTRAL FRACTURES OVER 60

Total	100
Average age	72.69 years

TROCHANTERIC FRACTURES UNDER 60

Total	36
Average age	44.66 years

TROCHANTERIC FRACTURES OVER 60

Average age	74.3 years
Total	101

MORTALITY OF FRACTURES IN AND ABOUT HIP

	Number	Died	Per cent
Intertrochanteric	147	22	15
Central fractures	115	15	13
Total	262	37	14

COMPLETE CENTRAL FRACTURES OVER 60

Age	Total	Solid Per cent	Fibrous Union; Good Function Per cent	Doubtful Union; Good Function Per cent	Non-Union Per cent
60-69	22	12—50	2—8	1—4	7—29
70-75	15	6—40	1—6.6	2—13	6—40
Over 75	10	1—10	2—20	2—20	5—50
Total	47	19—40.4	5—10.6	5—10.6	18—38.3

COMPLETE CENTRAL FRACTURES WITH AND WITHOUT ARTIFICIAL IMPACTION

	Artificially Impacted	Not Artificially Impacted
Solid union	17	17
Good function; fibrous union	0	2
Doubtful union	1	0
Non-union	8	7
Total	26	26

COMPARATIVE END RESULTS OF CENTRAL AND TROCHANTERIC FRACTURES

	Average Age	No. of Cases	Solid Union	Doubtful Union Per Cent	Fibrous Union Per Cent	Non-Union Per Cent	Good Function Per Cent
Trochanteric	66.4 yrs.	125	125 (100%)	0	0	0	125—100
Complete central	64.1 yrs.	75	40 (53.3%)	5—6.6	6—8	24—32	51—68
Impacted central	64 yrs.	25	25 (100%)	0	0	0	25—100

The mortality is higher in trochanteric fractures than in central fractures, if estimation is made of all cases regardless of age. Of 147 trochanteric fractures there were 22 deaths (14.9 per cent). Of 157 central fractures there were 16 deaths (10.2 per cent). But in the elderly, over the age of sixty, the death rate is higher in central fractures than in trochanteric fractures. Of 47 central fractures there were 15 deaths, or 32.1 per cent, whereas, in 101 trochanteric fractures there were 22 deaths, approximately 22 per cent. Mortality is exceedingly low in all below the age of sixty, there being only one case in central fractures and no deaths in trochanteric fractures.

Fifty-three per cent of complete central fractures, 100 per cent of impacted central fractures unite with efficient treatment by osseous union. One hundred per cent of trochanteric fractures unite by osseous union, with or without treatment; therefore, it is quite evident that osseous union may be expected in a high percentage of fractures about the neck of the femur. But it is also evident that there is only one type, notably complete central fractures, which present a difficult physiological problem by which union is secured with difficulty, and the necessity of differentiating the results and other factors in this type is obviously essential to avoid confusion and to promote a better knowledge of the subject.

DISCUSSION

Dr. Emil Geist (Minneapolis): Dr. Campbell is to be thanked for presenting to us once more this important subject in such an interesting manner.

The subject is so large that I will confine my remarks to the fresh fractures. It is an important subject for many obvious reasons, chief among which are: (1) the frequency of the occurrence of these fractures; (2) the usual advanced age of the patient (I call this the grandmother fracture); and (3) the serious prognosis.

Good results range from 40 to 90 per cent as reported by various authors. The average in the nation runs just about as Dr. Campbell has given it today, from 50 to 55 per cent. This, I think, is the reason why so many today are attempting to better this percentage by instituting some form of open operation.

The old division between intracapsular and extracapsular fracture is not a bad one; it is practical. Extracapsular fractures as Dr. Campbell has pointed out, always unite, no matter what the treatment. Of course, even here there are exceptions. I remember a case of non-union of a peritrochanteric fracture.

In the intracapsular type we frequently have non-union, even when the abduction treatment is used. It is curious to note that Dr. Whitman, the author of this method, has never published his own end-results.

Dr. Campbell alluded to the element of circulation as possibly being the cause of good union, or its absence as one of the causes of non-union. There is another factor that might be considered (it has been brought up now and then for the past twenty-five years), and that is the presence of the synovial fluid. Why should a central fracture unite in only half the cases, and why should a fracture a short distance off, the so-called peritrochanteric, always unite? Then, again, we have fractures in other locations where the broken-off fragments are bathed in synovial fluid and that frequently do not unite. I refer to the head of the radius and to the navicular bone of the wrist. This is food for thought.

It is conceded by everyone that among the closed methods, the abduction treatment is the one to follow. The difference in percentage of union rose from thirty-five, as a result of the abduction method, to about fifty-five per cent. So we already, thanks to Dr. Whitman, have a 20 per cent increase in our percentage of success the country over.

Dr. Campbell is to be complimented on his excellent results, and I personally know that I am voicing the sentiment of the meeting when I say—thank you.

Dr. M. S. Henderson (Rochester): Dr. Campbell has brought us a real message today. I know of no one in this country who has treated the number of cases of fractures of the hip that Dr. Campbell has. Also, I know of no one who has followed his cases through to the end so that he really knows what has happened to them. I should like to say many things about this subject, but I am going to be brief and will present some slides to emphasize a few points.

(Slide) My first slide is from the films of a woman, sixty-eight years of age, who, while crossing the street, was struck by an automobile. She fell and sustained an intracapsular fracture of the necks of the femur, of the central type. Under anesthesia we reduced the fracture and put her up in the Whitman abduction position. That was in July. The next film was taken in November. I think you will agree that the union was complete. We allowed her up on crutches, and while walking along the corridor in the hospital, with a nurse beside her, she slipped; although partially supported by the nurse on one side and leaning against the wall on the other, she slid to the floor.

She sustained a fracture of the other hip, but as you will note, it is not a complete fracture but rather of the nature of a crushing inward of the neck just below the head. The head itself is intact. (Slide) We merely put her to bed, put a Thomas extension splint on for about five weeks, and at the end of six weeks had her using the limb. This particular type of fracture needs no reduction or prolonged fixation. In other words, this type of fracture will give a good result regardless of treatment.

This last slide shows the same case two and one-half years later. This woman was sixty-eight when she fractured her hip. She is over seventy now. She car-

ries on her business as a saleslady, walking back and forth to work each day. The first fracture demanded careful and prolonged treatment. The second fracture as stated would have given good results regardless of the treatment given.

(Slide) A few years ago the American Orthopedic Association attempted to collect information concerning the end results in fractures of the hip and called on its members and others for data. This slide gives the end results of forty-two cases that we were able to trace definitely in the Mayo Clinic.

You will notice that the results in patients under sixty are much better than in those over sixty, and they coincide very closely with those of Dr. Campbell's. Although there are only forty-two cases, the end results are known. There was a mortality rate of 13.3 per cent in those under sixty and 14.8 per cent in those over sixty. The patients succumbed to incidental causes such as appendiceal abscess, pneumonia, pulmonary embolism, shock, and uremia. In other words, it is the complications that are prone to occur in people at this time of life that carry them off, and not the fracture itself.

Not counting the deaths, but considering only those patients who survived, we obtained bony union and excellent results in 76 per cent in those patients under sixty, but obtained good results in only 54 per cent in those over sixty.

I greatly enjoyed Dr. Campbell's paper.

DR. W. C. CAMPBELL (closing): In answer to Dr. Henderson, when I stated four weeks, I meant four weeks. I would like to explain that, if we see a fracture at the end of four weeks in which no reduction has occurred, the chances of union by any form of conservative treatment are so slight that we should treat it as an un-united fracture. We should operate on ununited fractures of the neck of the femur early by employing the bone peg graft. In most of the fractures not examined until the end of four weeks there is no apposition, and the fragments are far apart. However, a case was reported by Zadek in which two months had elapsed without treatment and union was secured by conservative measures, but in all probability such results are very rare. If union is to be secured, the proper treatment must be instituted soon after the occurrence of the fracture.

Trochanteric fractures are often confused with central fractures of the neck of the femur. After analyzing a large number of cases I have found that the average age is seventy-four in those above sixty, for trochanteric fractures, and seventy-two years for central fractures. So you can see that the trochanteric fracture is also a fracture of old age. That is one reason why confusion often arises as to end results.

The mortality in central fractures above the age of sixty is thirty-two per cent. The mortality below the age of sixty is nil. The mortality, taking them all together, runs about sixteen per cent in central fractures. The mortality in trochanteric fractures is twenty-two per cent above the age of sixty, and below the age of sixty there is no mortality at all. In trochanteric fractures this can be very materially reduced by the treatment I have just mentioned in the elderly, being able to remove casts and apparatus and getting them up, sitting up out of bed at a much earlier time.

I think we will find in subsequent statistics we will reduce the mortality in the elderly in that type of case.

DAVIS METHOD OF PROSTATIC RESECTION*

THEODORE M. DAVIS, M.D.
Charlotte, North Carolina

MY BEING selected to present the subject of prostatic resection before your distinguished society is an honor that is greatly appreciated and stimulates my greater interest in a subject which appears to be of lively interest to the medical profession at the present time.

Perhaps there is no operation that has done more to relieve the suffering male patient than prostatectomy. The stern necessity for removal of urinary obstruction has required surgical removal of the prostate gland in many men past middle age. In spite of the improvement in surgical technic, the marvelous improvement in preoperative preparation of patients, the special attention given to decompression through drainage, the improvement in the various laboratory methods for determining the proper time for operation, this operation, with its potentially high mortality and morbidity rate, has not fulfilled the ideal. The success of prostatectomy has been so generally accepted by the profession that, until recently, removal by a minor operation of only that portion of the gland causing obstruction has received indifferent attention, except from a few surgeons.

One has only to review the literature to observe the array of splendid devices and procedures which have been advocated for the relief of vesical orifice obstructions, which is sufficient testimony to the eagerness to substitute methods of simplicity for the former orthodox measures with their complications and dangers.

All operators are familiar with the marked shrinkage that regularly occurs in the enlarged prostate following the preliminary cystotomy drainage prior to the subsequent enucleation in the two-stage prostatectomy. Since the prostate diminishes in size with the removal of the residual urine through a cystotomy incision, the

*From The Department of Prostatic Resection, Crowell Clinic of Urology and Dermatology, Charlotte, N. C. Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 25, 1932.

same shrinkage follows the adequate drainage instituted through removal of the tissue that is impinging upon the vesical orifice and posterior urethra. When this can be successfully accomplished through transurethral resection, the indications for more radical surgery vanish, for few men will submit to a prostatectomy when a minor procedure will permit them to void freely and completely empty their bladders.

Regardless of the type of obstruction or the operation that is to be performed, it is of paramount importance to properly prepare these patients by thorough decompression with a retained urethral catheter. A careful watch should be maintained of the nitrogenous constituents of the blood; the renal function should be stabilized and the correction of other constitutional abnormalities should receive appropriate consideration. It is only by adhering to these well known surgical principles that optimum results and a minimum mortality rate can be obtained.

The operation of resection is performed by means of suitable electric currents applied through special instruments within the urethra. There are several instruments that are now available for accomplishing this type of operation and the author has had ample opportunity to try his skill with the various instruments with special attention to the most promising.

The peculiarity of the individual operator and the skill that he has acquired as a cystoscopist with the various types of lens instruments will undoubtedly cause confusion in orientation within the urethra when he attempts to use a lens system with which he is not familiar. A correct interpretation of disease at the vesical outlet is essential before any transurethral operative procedures should be attempted.

Of the various instruments advocated for resection, I have no hesitancy in stating that, in my opinion, the Sterns resectoscope has no superior. This instrument is composed of a sheath 28 F. in size with a fenestrum ⅞ inch in length. The fenestrum is 3/5 of the diameter of the tube in depth and is closed by an obturator during introduction. The working parts consist of a direct vision telescope, a light carrier, a water conduit and the loop electrode. The loop electrode is operated by means of a rack and pinion mechanism and can be made to traverse the fenestrum as the operator desires. In operating, the tissue to be removed is engaged within the fenestrum and the loop will be observed resting upon the tissue prior to its removal, and the action of the current is in full view at the beginning of the section. A slight pressure on the sheath holds the tissue firmly within the fenestrum and there is no tendency for the entire instrument to creep, with the possibility of removing tissue from an area that is not predetermined. The loop removes only tissue that protrudes within the fenestrum. The forward thrust of the loop carries the sectioned tissue into the tip of the sheath, permitting perfect visualization of the entire gutter from which the section was removed. The section of tissue adheres to the loop and is withdrawn with the working parts after each section. It is never necessary to search within the bladder or to depend on irrigation to flush the sections from the bladder through the sheath, a procedure that may prolong the operation where a large number of sections are to be removed.

The new McCarthy electrotome is an excellent instrument with almost perfect visualization. The loop is placed beyond the protruding tissue and the sectioning is towards the lens system. The sectioned tissue remains within the gutter formed and has to be removed from its bed with the loop or flushed from the bladder. The location of individual bleeding vessels at its source is more readily accomplished with this instrument.

From the earliest reports of transurethral correction of vesical orifice obstructions, the occurrence of hemorrhage has been the chief difficulty, restricting, formerly, such procedures to the smaller obstructions. With the application of suitable electric currents, hemostasis can be rapidly and permanently attained. From my initial experiments with resection, it was realized that the sectioning of tissue and the control of hemorrhage could not be rapidly and permanently accomplished with the same type of current. After numerous experiments with every type of generator that has been developed, I am more than ever convinced that my initial conception was correct.

I am of the opinion that excessive coagulation is to be avoided to prevent sloughing and secondary hemorrhage. I also insist that, in order to obtain effective hemostasis, the tissue must be coagulated sufficiently to permanently seal the bleeding vessels, to prevent their opening during

manipulation or after a lapse of several hours. Subsequent uncontrollable hemorrhage would necessitate additional measures and in some instances, cystotomy. Even fatal hemorrhage has occurred in the experience of several operators. Hemostasis, when properly established, should and will be permanent.

The character of the different high frequency surgical currents employed varies immensely and different types of current produce radically different results. For your clearer conception, I will describe, briefly, the characteristics of the more important with which we have to deal. Generally speaking, there are two types of high frequency currents—damped and undamped. An undamped current is one which oscillates in the direction of flow and has a substantially uniform rate of amplitude, with practically continuous application of energy. This type of current is usually generated by means of a vacuum tube, has excellent cutting qualities but a very thin depth of coagulation.

A damped current is one which varies periodically in rate as well as amplitude and flows with recurrent bursts of energy or electrical discharges of considerable intensity but of short duration, with dead or inactive periods between wave trains. This current has excellent coagulating but no cutting qualities.

A moderately damped current, when applied through the proper electrodes, has the characteristic of severing tissue as readily as the sharpest scalpel, while the intense heat generated at the point of contact dehydrates the severed edges of tissue, thus sealing off the capillaries, lymphatics and smaller blood vessels. To seal the larger vessels permanently, a highly damped current is most efficient.

In all types of vacuum tube generators, by reducing the plate voltage, the current output will slowly coagulate tissue if applied for a sufficient length of time, but this coagulation is superficial and hemorrhage may occur from manipulation of instruments or, in many instances, after the patient has been returned to bed. The ideal hemostatic agent during resection is a highly damped current with the loop in contact with tissues. An exposure of about one second will coagulate to a sufficient depth so that the hemorrhage is permanently controlled.

The Davis-Bovie Electro-Surgical Unit is constructed in two entirely separate sections within one cabinet. The cutting section produces a moderately damped current, which has been found to section tissue with the least amount of hemorrhage. The other, or coagulating section, supplies a highly damped current which has no cutting qualities and is, therefore, ideal for the coagulation necessary for rapid hemostasis. Each section is an entirely separate electrical circuit with individual controls and adjustments. An electro-magnetic selector is provided, which instantly connects either to a common outlet through the operation of the proper treadle of the double foot switch.

The perfection of the instruments and application of suitable currents permits the removal of sufficient tissue with adequate hemostasis under vision, permitting the correction of many obstructions that were formerly considered amenable only to complete enucleation of the gland. The fundamental principle in this problem is the removal of the obstructing tissue, either by excision or destruction, or by a combination of these, sufficient to relieve the obstruction with a minimum of injury to the surrounding parts. Equally important is the restriction of complications and the adequate control of hemorrhage. With the present equipment, it is possible to relieve more than 90 per cent of the cases with an operation that is simple, wherein the risk is negligible and the final results are equal, if not superior, to those obtained by prostectomy.

The amount of tissue that should be removed will vary with the type and amount of obstruction. The experience gained from a few of my earlier cases demonstrated that to insure a permanent result it is necessary to do more than a mere canalization of the prostatic obstruction. This procedure will cure cases with bars and contracture, but in the larger obstructions at least two-thirds of the obstructing gland should be removed. Where this has been accomplished, the results have been permanent.

In my series of cases the residual urine has varied from nothing to forty-eight ounces with complete retention. The amount of residual is not a criterion of the amount of obstruction present. In some patients without residual, large bilateral adenofibromatous hypertrophy was found; in others, with complete retention, only a

small bar or median lobe was found to be causing the obstruction.

TYPES OF CASES RESECTED

Contracted vesical orifice		22
Median lobe or bar		102
Unilateral lobe		8
Unilateral and median lobes		39
Bilateral lobes		62
Bilateral and median lobes		74
Carcinoma		43
Following previous prostatectomy:		
Perineal	10	
Suprapubic	14	
	24	24
Total		374

Last year, 158 obstruction patients were operated upon by resection, while only twelve underwent prostatectomy. During the present year forty-six have been resection cases and only two have been cases of prostatectomy.

Twenty-four of the patients reported in this series had been subjected to a prostatectomy within the past five years prior to their admission for resection, when a recurrence of the obstruction was found.

Fifteen patients have required a second operation within six months as sufficient tissue was not removed to insure a permanent result. Eleven of these patients were among my earlier resections with an equipment that was far inferior to that in use at the present time. Four of them, however, were during the past year. The anesthetic in these four cases was of short duration and unusual difficulty was experienced in controlling hemorrhage. Although canalization was accomplished, the results were not satisfactory and a second operation was necessary. The experience gained in these cases demonstrated that canalization will not insure permanent results.

Hemorrhage.—One of the chief difficulties in transurethral operations has been the proper control of hemorrhage. The current supplied by the Davis-Bovie unit reduces hemorrhage without excessive coagulation during each sectioning of tissue. The highly damped current supplied by this unit is superior to other types of current in the control of bleeding vessels not controlled by the cutting current. I recently experienced unusual difficulty in two cases in the control of hemorrhage. In one of these there was a carcinoma. The application of the coagulating current would control the hemorrhage temporarily but it would recur in a few seconds. Excessive coagulation was necessary for permanent control. The subsequent course of the patient demonstrated that no damage resulted from the coagulation. In the other case there was a small bilateral prostatic hypertrophy. During the operation there was a sudden rise in blood pressure from 180 to 240 systolic. Application of the coagulating current resulted in identically the same experience as outlined above. No untoward symptom has resulted from the excessive coagulation employed.

One patient required cystotomy for the control of hemorrhage. A carcinoma that involved the left lateral wall of the bladder was resected and it was found that the bleeding vessel was in such a position that it could not be reached with any instrument at hand. At operation it was found to be in a villous process about two inches from the operative site, which was clean and free from hemorrhage.

Two instances of postoperative hemorrhage have occurred, one on the tenth and the other on the fourteenth day. In both of these cases bleeding was easily controlled by evacuating the clots and coagulating the bleeding vessels per urethram. The ease with which clots may be evacuated with the author's cystoscopic curet and the vessel controlled leads me to regard secondary hemorrhage of minor importance.

Infection.—As the lymph channels and blood vessels are sealed by the current, post-operative infection has been of negligible frequency. The temperature elevation has varied from normal to 104 F. Approximately 16 per cent of the patients have had an elevation above 99 F. The temperature has not persisted longer than one week except in two cases in which it was elevated for a period of ten days. A chill preceded the fever in eighteen cases. The temperature elevation has been lower as a rule in those cases that have had prolonged preliminary drainage with a retention catheter and have developed an immunity to instrumentation. Eight cases of epididymitis have developed, all subsiding without interference. There has not been any case with symptoms that have led us to believe that a pyelitis or other kidney infection has resulted following the operation, although in a number of cases the edge of the section has been within one

quarter of an inch of the ureteral orifice on one or both sides.

Carcinoma.—Forty-two of the patients in the series had carcinoma. Four have died of carcinomatosis without recurrence of the obstruction. One of these lived three years and nine months after the operation. Two had a recurrence of the growth within the urethra, that caused bleeding before micturition and required additional treatment. One patient, thought at the first operation to have had an adenoma, required a second operation in which the tissue showed the presence of adenocarcinoma. As shown by a questionnaire five months ago all others are living and free from obstruction.

Incontinence.—There has not been a case of incontinence following the operation in the benign obstructions. A temporary incontinence has been observed in three patients with carcinoma. Why these occurred I am unable to explain. These patients had radium element inserted through the perineum. In two of these patients the incontinence was of four and six weeks duration. In the third it has persisted for three weeks and I presume that it will subside as have the other two after a lapse of sufficient time.

Potency.—A remarkable feature following resection is the rejuvenation of the sexual activity of these patients. All except two report that their libido has been markedly improved and many claim that they are as potent as they were twenty or more years before. One must regard this feature with conservatism as the natural tendency for the male is to exaggerate his sexual ability.

Hospitalization.—The average stay in the hospital after the operation has been four days. Eight patients have remained two weeks, twenty-seven one week, while all others have been dismissed within three to five days.

Mortality.—There has not been a death immediately following resection. Three patients have died within four weeks following the operation. The first patient had a very severe cardiac condition and the resectoscope was used only to control hemorrhage that was caused by the examining cystoscopy. He was dismissed from the hospital in three days and died a cardiac death three weeks later. I do not think that the instrumentation hastened his demise. The second, a patient with coronary sclerosis, was dismissed from the hospital in four days after the operation, was up and about feeling fine, without urinary symptoms, when he suddenly died in an attack of angina pectoris two weeks after the operation. A third patient was dismissed from the hospital in good condition. While at his distant home a slough from the coagulated site caused complete retention and at his return to the hospital he showed an hemorrhagic nephritis which eventuated in a uremic death three days later and three and one-half weeks after the operation. I accept these as my postoperative mortality—which is less than one per cent.

Postoperative Residual Urine.—The majority of patients completely empty their bladders following the operation. There has not been a residual of over two ounces at the time of primary dismissal. Upon a return for a recheck examination this residual has been reduced to less than one ounce in every case except in the cases reported that required addition measures to insure adequate drainage. After sufficient time has elapsed, shrinkage of the remaining gland has been noted and the residual has disappeared.

Recurrence.—I will report the number of patients operated upon in yearly groups prior to discussing the question of recurrence.

Year	Number
1927	26
1928	36
1929	42
1930	66
1931	158
1932	46
Total	374

You will note that 170 of the cases were operated upon prior to 1931, 158 during 1931 and the balance during the present year. Of the 170 cases, eleven had to have a second operation within six months as outlined above. Of the 158 cases operated during the past year, four had a second operation within six months. One patient was operated upon in 1929 and a grade 2+ median lobe removed. The lateral lobes at this time were not enlarged. He returned in 1931 with complete retention due to a large bilateral lobe, which was resected. A patient was operated upon in 1930, and the tissue reported adenoma. He returned this year with obstruction and was again resected and the tissue report was adenocarcinoma. Two patients with carcinoma operated upon in 1931 returned with a recurrence

of carcinoma within the urethra, with symptoms of blood in the first urine, and resection was again performed to remove small papillomatous growths from the urethra.

The majority of the glands operated upon during 1927 and 1928 were of the smaller obstructive type; a goodly number, however, were typical adenomatous hypertrophy. It is gratifying that although we did not remove as much tissue at that time as we would in a similar case today the results have been satisfactory and they are free from obstruction.

During the years 1929, 1930, 1931 and 1932 approximately 25 per cent of the cases have been of the larger types of hypertrophy. While these cases have only been operated upon for three years or less the results have been good.

I do not know what the percentage of recurrence in all of these cases will be over a five or ten year period. Time alone can tell. It is probable that we will have a higher percentage of recurrence than the results in my earlier cases would indicate. Considering the experience of Caulk in a large number of cases over a ten year period and of the few cases of my own that have extended over four or five years, I am inclined to believe that the incidence of recurrence will be small.

THE RESULTS OF RESECTION OF THE PROSTATE GLAND*

HERMON C. BUMPUS, JR., M.D.
Rochester, Minnesota

THE sacrifice of the patient's prostate gland as a ransom for the freedom to urinate during his declining years has been accepted until recently almost without question by him and by his physician. If this sacrifice could be made with a risk no higher than that incurred in the surgical treatment of other benign lesions it would be justified, provided the functional results were reasonably good. When it is realized that the mortality from prostatectomy skillfully performed is double that from operations generally, and that the functional results will in many cases be disappointing, it seems pertinent to recall the significant fact that only a small portion of any hypertrophied gland causes obstruction, and that the prostatic tissue adjacent to the urethra, if it does not encroach on its lumen, is not of importance and need not be considered in relieving the obstruction as its hypertrophy into the rectum or bladder is of no more detriment to its possessor than that of any other signs of advancing age.

When one remembers that the diameter of the urethra is less than 1 cm. and the normal distance from the verumontanum to the neck of the bladder is less than 2 cm., it readily becomes apparent how little such tissue is needed completely to obstruct the urethra, and how really insignificant an amount can partially obstruct it. To cite an analogy, let the bladder be considered a flask and the urethra its neck. A stopper that will completely close the outlet is comparatively small and that which will partially obstruct it is still smaller.

To remove this obstructing tissue without removing the remainder of the hypertrophic gland requires an instrument which will meet three major requirements: (1) it must remove all the obstructing tissue at the time of operation, since to remove only a portion in the presence of residual urine will aggravate, not improve, the symptoms from which the patient is suffering; (2) the operation must be carried on under adequate vision so that the obstructing portions of the gland may be seen and their relationship to other structures determined before their excision, and (3) the procedure must be such as to insure adequate control of bleeding either during or immediately following the excision.

Braasch, in 1918, developed an instrument called a median bar excisor which permitted the operator for the first time to remove obstructing cicatricial tissue from the neck of the bladder under full vision. The instrument was adequate for the relief of this type of obstruction, but as it did not provide for the control of bleeding it was not applicable for the relief of obstruction that resulted from adenomatous hypertrophy of the prostate gland. I believed that this type of ob-

*From the Section on Urology, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, St. Paul, May 23 to 25, 1932.

struction could, in certain cases, be treated in a similar manner, and I therefore, modified Braasch's instrument so that larger amounts of tissue could be removed; the bleeding was controlled by electrocoagulation of the cut vessels. The first operation was performed in the spring of 1926, and in the last six years I have used the instrument in more than 300 cases.

As the instrument is now employed it consists of four parts: first, a direct Braasch cystoscope of diameter number 28 French with a fenestra near its distal end. Second, a cylindric sheath for closing this opening; this sheath carries a guide for holding a flexible electrode. Third, a multiple needle electrode in which the needles are arranged in a semicircle similar in size to the circumference of the tubular knife. Fourth, a tubular knife.

After the instrument is in place and the obturator withdrawn, the bladder is filled with fluid and the cylindric sheath inserted. By closing the fenestra the instrument is converted into a direct cystoscope and it is possible for the operator to examine the neck of the bladder before commencing the operation. When the portions of the hypertrophied lobes causing the obstruction are found, the sheath closing the fenestra is withdrawn and as much of the obstructing portion of the gland as possible is forced into the opening. This is done under vision, as the proximal end of the instrument is open and the fenestra can be made to grasp any portion of the gland desired. The sheath that covers the fenestra is not necessary for adequate vision but simply makes the movements of the instrument easier as it prevents projecting parts of the prostate gland from projecting into the lumen of the instrument.

When the tissue to be excised is firmly engaged, the multiple needle electrode is passed through the lumen and thrust into the projecting tissue. These needles are so placed that they form a semicircle in the exact situation the tubular knife will cut. A high frequency current is then run through them, thus rendering the tissue to be cut by the knife ischemic by electrocoagulation. The coagulation is never prolonged sufficiently completely to coagulate the removed tissue as with the Day and Kirwin instruments, but simply long enough to coagulate the course the tubular knife is to follow. When the coagulation is considered complete, usually after the lapse of ten to fifteen seconds, the needles are removed and the tubular knife is thrust through the projecting tissue. The excised portion is removed from the lumen of the knife on its withdrawal.

This procedure is repeated as often as necessary to remove whatever tissue is obstructing the urethra. If, as usually happens, there are some vessels whose bleeding has not been controlled by the needle electrode, the instrument is again converted into a direct cystoscope while still in place, and through the catheter guide, which is incorporated in the cylindric sheath, an electrode is passed and the bleeding points electrocoagulated individually under vision. This manipulative procedure is no more difficult than passing a catheter into a ureteral orifice, and is done in much the same way.

As Caulk has pointed out there is considerable clinical evidence to show that once residual urine occurs as a result of urethral obstruction from hypertrophy of the prostate gland the presence of this urine stimulates hypertrophy, the increased hypertrophy in turn causes more retention and a vicious circle is established. Whether this is true remains to be proved, but all urologists, and probably most observant physicians have noted that following suprapubic drainage of a bladder distended by obstruction of an enlarged prostate gland, the gland invariably diminishes in size. For this reason in cases of increased risk a two-stage prostatectomy has frequently been employed. If removal of residual urine by suprapubic drainage results in shrinkage of the prostate gland, it seems self-evident that residual urine will be relieved by the removal of the obstruction from the urethra, and the same shrinkage in the size of the gland will occur. This observation is important in this form of treatment for, although the amount of residual urine present is not an indication for or against transurethral relief of the obstruction, it is a positive indication of the success or failure of the procedure after the operation has been performed.

Between January 1, 1925, and January 1, 1932, I performed some form of transurethral resection in 250 cases for the relief of enlargement of the prostate gland which had produced ureteral obstruction. At dismissal 171 of the patients were catheterized to determine the presence or absence of residual urine. None was found in 120 cases, in twenty-nine less than 30 c.c. was found, and in twenty-two some was present.

There is no record of catheterization in seventy-nine cases, presumably because the patients were free from symptoms. Before transurethral resection there was more than 150 c.c. of residual urine in each of 105 cases, and in forty-six (20 per cent) of these it varied from 300 c.c. to complete retention.

The position of the hypertrophied tissue rather than the amount of residual urine, indicates the advisability of employing resection for its relief. As I have stated the amount of residual urine is not one of the criteria for or against adopting resection, but it is the best method of measuring its success. Frequently on removal of the catheter from 30 to 100 c.c. retention may be noted for a few days until the edema incident to the operation has subsided. If more than this is present the operator has probably failed to remove sufficient tissue. Such patients are fortunate if they escape a stormy convalescence which usually may be followed by subsequent resection. It is the complete relief of obstruction with its resulting residual urine that makes this procedure so well tolerated and so rarely followed by serious afebrile reactions.

If sufficient tissue is not removed completely to relieve the obstruction, shrinkage of the gland does not occur and failures will result. Therefore, it seems advisable to remove only sufficient tissue to give an adequate channel from the bladder through the prostate gland so that at the completion of the operation one should be able with the instrument at the verumontanum to look directly into the bladder at the level of the trigone. To construct such a channel requires usually the removal of only 5 to 10 gm. of tissue, although in a few cases in which hypertrophy is greater, more tissue may have to be resected. Efforts to remove the greater portion of the gland seem to defeat the purpose of the operation, and are contra-indicated, for a new and adequate passage through the gland is what is required. It is seldom that the removal of more than 20 gm. of tissue is required to accomplish this, and usually the removal of less than 10 gm. results in complete emptying of the bladder. If two-fifths of the hypertrophy of an enlarged gland represents its obstructing part and 20 gm. is arbitrarily taken as the maximal amount of tissue easily resectable through the urethra, then all hypertrophied glands weighing 50 gm. or less, should be suitable for transurethral resection.

In the last three years at The Mayo Clinic, 575 cases of benign hypertrophy of the prostate gland were treated suprapubically. In only 32 per cent did the removed tissue weigh more than 50 gm., indicating the large field of application for transurethral relief of obstruction.

Since January 1, 1925, I have treated more than 300 cases of obstruction of the neck of the bladder by various methods of transurethral resection of the obstructing tissue. This does not include those so-called cases of contracted neck of the bladder which are best treated by sphincterotomy with the Collings electrode. So far, I have never found it necessary to remove more than 25 gm. of tissue, and relief of obstruction is obtained in most cases by the resection of from 5 to 10 gm. Operation was performed on 186 patients with the instrument I have described prior to January 1, 1932. In seventy-four cases the removed tissue was predominantly adenofibromatous, and in ninety-four inflammatory changes were more marked. Malignancy was found in sixteen cases and tuberculosis in two. Four patients died in the hospital, one patient, aged seventy-three years, had extensive carcinoma and embolic pneumonia developed. Two patients, aged sixty-five and seventy-eight years, respectively, died fifty-nine and thirty-three days after operation from sepsis, the indirect result of the procedure. The fourth patient also died from sepsis, which occurred on the seventh day after operation. I doubt if mortality can be avoided from transurethral operations when patients are aged more than seventy years.

If all obstruction is removed and residual urine does not persist, a considerable area of denuded tissue may be expected to heal rapidly, but it must not be overlooked that bleeding is controlled in this operation by electrocoagulation, which causes destruction of tissue. This has to be absorbed or slough away, and if residual urine is not completely removed conditions are ideal for the development of secondary infection. It is, therefore, most important to reduce to a minimum the amount of tissue destroyed by electrocoagulation, and for this reason I prefer to use it only for the control of bleeding, and to depend on the knife rather than the high frequency current for the excision of tissue.

In five of the 186 cases, prostatectomy was necessary subsequently. In four cases the opera-

tion was done within the year, and was obviously due to failure to remove sufficient tissue at the first operation. In the other case, one of adenofibromatous hypertrophy, prostatectomy was done four years after the original resection and was evidently due to continuation of the hypertrophy. As operation in this series of cases was done over a period of six years, subsequent prostatectomy because of continued hypertrophy of the prostate gland would seem to be the exception that proved the rule that residual urine is a stimulation to prostatic hypertrophy, and that with its removal hypertrophy does not progress.

Of the 168 patients with benign and inflammatory obstruction treated during the last six years, three died in the hospital, 148 have been traced by letter and subsequent visits. Of these, 114 express themselves as being satisfied with the procedure, whereas thirty-four still have urinary symptoms that they felt should have been relieved.

The low mortality associated with this form of relief from prostatic obstruction is not its only recommendation. Quite as important is the short postoperative convalescence, usually free from any distressing complications; the majority of patients (100 of the 168) left the hospital within ten days. The saving in hospital care in such cases at the University Hospital in Iowa has been estimated at $45,000 a year. When one remembers that the dressings following operation on the prostate gland cost more than for any operation except colostomy, and that the average stay in hospital is estimated at six weeks with one or two special nurses during a part of this period, this estimate does not seem too great.

A procedure that involves less risk and gives final results equal to those obtained by a major surgical procedure, besides reducing hospital expense and permitting the patient to meet his financial obligations to the profession, deserves careful consideration.

A QUANTITATIVE STUDY OF VIBRATION SENSE IN NORMAL AND PERNICIOUS ANEMIA CASES*

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NO truly quantitative method for the determination of threshold values of human vibration sensation has so far been satisfactorily developed. The value of the usual clinical method of determining vibration sense is restricted. It can show total or marked loss of vibration sense well for a given fork, but provides no satisfactory measure of relative amounts of loss. The present work was undertaken to develop a more precise method of testing and evaluating the vibration sense threshold.

LITERATURE

Rumpf[1] was the first to study vibration sense quantitatively. He used successive stimuli obtained from faradic current of thirty-two interruptions per second. He also tried a four-sided ruler of wood, provided with varying interruptions along its edges; the sensation of a rough body was produced by drawing this ruler across the skin at a fixed rate of speed and with even pressure. Rumpf finally used a set of fourteen tuning forks whose vibration rates were from 13 to 1,000 per second. Over many points of the body, both bony prominences and muscular parts, he determined the fork whose vibrations could just be perceived. He thought that an anesthetic zone might be outlined by means of a tuning fork.

Treitel[2] used a C128 fork fifteen centimeters in length, with displaceable weights on its prongs and with a foot plate of horn to avoid temperature disturbances. He recorded the seconds during which the vibrations of the fork were appreciated at different points, and in some instances also the length of time the fork could be heard. He noted that vibrations might be felt after the fork had been stopped, much as tones are heard for a period of time after a sounding instrument is removed from the range of hearing.

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Egger[5] wrote rather extensively upon "Osseous Sensibility." He used tuning forks of 128, 512 and 2,048 vibrations per second. The vibrations of the latter fork were imperceptible for a normal individual, and the fork of 128 vibrations per second furnished the most powerful vibratory stimuli. Bing[9] states that Egger used a fork of 128 vibrations per second, weighing about 500 grams and having a foot piece six millimeters in diameter. Egger noted that vibration sensation diminished in intensity with age, though even at the most advanced ages it was never entirely absent. Dweitschenko[4] observed that a healthy individual always clearly perceived the sensation arising from a vibrating tuning fork when placed over a bone. The perception of a younger person was better than that of an older one. A thick layer of soft parts overlying bone greatly reduced vibratory sensibility.

Rydel and Seiffer[5] tested vibration sensation, which they termed "pallæsthesia," by placing the tuning fork on symmetrical parts of the body and comparing the two sides. In order to regulate time elements, they adopted the Gradenigo triangle.

In 1899 Gradenigo[6] presented a method whereby auditory acuity could be tested with a greater degree of accuracy than had previously been the case. He said that if a tall triangle were painted on the end of a prong of a tuning fork which was capable of vibrating with a sufficient amplitude, this figure would appear more or less doubled when the fork was in vibration. The duplicate images of the triangle would overlap, the overlapping portion becoming very distinct in outline and color, and the outer portions appearing more pale and less distinct. Then as the vibrations of the fork decreased in amplitude, the field of overlap would become greater in size. The increase in size of this overlap triangle would thus correspond to the diminution of amplitude of the vibration and would, therefore, become a measure of the amplitude. By putting black lines on a white background at right angles to the perpendicular of the triangle there was obtained an index of the amplitude of vibration at any instant of the tuning fork's decrement.

The Gradenigo triangle which Rydel and Seiffer attached to their fork was marked off into eight such calibration units. The fork was of sixty-four vibrations per second, 100 grams weight, twenty-three centimeters length and had a plate of horn on its base to avoid temperature differences. Their observations were subject to inaccuracies arising from estimating severely reduced vibration sense thresholds. If the patient still felt the vibrations when the number upon the Gradenigo triangle was eight, that is, when the black triangle was back at rest, they called it nine, and if the patient received the vibratory sensation for a very long time after the fork was at apparent rest, they estimated the reading to be ten. As their readings over the skull and over the deltoid muscle were commonly seven, they thought that Egger was inaccurate in stating that vibratory appreciation was dependent upon overlying muscle.

Knapp[7] tested bony sensibility with forks of varying pitch, using a set of five or six C forks ranging from thirty-two to 2,048 vibrations per second. He thought that factors such as thickness of soft parts overlying bones being equal, there is no variation in sensitiveness between different bones as there is between different areas of the skin. He said that normally 512 vibrations per second is the greatest vibratory rate perceptible. He obtained a relative idea of the bony sensibility by comparing corresponding regions of the body.

Minor[8] used a tuning fork corresponding in all respects with that of Rydel and Seiffer, though he determined the length of time in seconds during which the vibrations were felt. He observed that in fractures, vibratory sensation in both the peripheral and proximal fragments was preserved. He stated that a continuously vibrating apparatus, electro-magnetically driven, should be used to test vibration sensibility accurately.

Bing[9] also used a fork equipped with a Gradenigo triangle. He tested various areas of the body and then retested those same areas after they had been anesthetized with carbon dioxide snow for thirty seconds, with adrenalin and cocaine infiltration or with ethylchloride freezing. In the anesthetized areas vibratory sensation rarely was appreciably reduced. He felt that the anesthetic probably caused an increased consistency of the tissues and the vibrations were, therefore, better transmitted to the bone beneath. Forli and Barrovecchio[10] likewise used a fork with a Gradenigo triangle. Like Rydel and Seiffer, they expressed vibration sense thresholds in units read from the triangle. The majority of

their readings were above eight and therefore not very precise.

Neutra[11] differentiated osteoacusis from vibration sense, using forks of 100 to 200 vibrations per second. He thought that one heard the vibrations conducted to the inner ear through the bone, and also through the denser connective tissue and cartilage. Dejerine[12] attempted to exclude osteoacusis by using a tuning fork having not over twenty double vibrations per second; this fork will not produce sound perceptible to the human ear. Neutra determined vibration sensibility in its "fatigue time." The technic is reviewed by Lewandowsky.[13] Neutra would place a vibrating fork upon a given point A, and when that fork was no longer felt at A, he would transfer it to a similar point B. The time which elapsed between the disappearance of the sensation at A and its disappearance at B he termed the "fatigue time." If the sensation was equal on the two homologous parts of the body there would necessarily exist a constant relation between A and B, that is, A to B would equal B to A. If, on the other hand, there was a disturbance of vibratory sensibility, no such correspondence between the two parts of the body would exist.

Sterling,[14] using the Rydel and Seiffer type of fork equipped with a Gradenigo triangle, checked their work and said that their quantitative estimations were much too high. He thought that the transference of vibration from the tuning fork into the body depended upon two physical laws. First, the intensity of vibration increases with the density of the vibrating body; therefore, the material of which a given fork is made is of considerable importance. Secondly, the greater the identity between the vibrating body and the part which carries the vibration, the greater becomes the conduction of the vibration; hence, a tuning fork will conduct the vibration very well through bone but quite poorly through skin and muscle.

Williamson[15] concluded that normally vibrations are always felt over the styloid process of the ulna, inner surface of the tibia, both malleoli, anterior superior iliac spine, the nails of the fingers and big toes, and over the abdominal wall, provided the vibrating fork is firmly in contact with the wall.

Head,[16] using a C128 tuning fork, measured vibration sense quantitatively much like Neutra did. Head's technic was more exact in that he measured the "fatigue time" with a stop watch.

Symns[17] made the first really quantitative estimation of vibration sensation. He used a specially constructed tuning fork with a frequency of 108.75 vibrations per second. Two pieces of steel were attached to the upper portion of the fork, arranged in such a manner that when the arms of the fork were vibrating, a small window was seen between them. This window disappeared when the vibrations of the fork reached a definite amplitude. The moment that the window disappeared the fork was applied to a subcutaneous bony point, and a stop watch started. The individual being tested signaled at the instant he ceased to appreciate the vibration. The watch was then stopped and the time recorded. Symns tested vibratory sensibility over both malleoli, tibia, anterior superior iliac spine, sacrum, sternum, radius and ulna. He tested a series of normal individuals and constructed the mean normal curve of their vibratory sensibility. Experimentally, when the skin was anesthetized, twenty per cent of the vibratory sensation was lost. The remaining eighty per cent of the sensation, he concluded, followed the paths of deep sensibility.

Wood,[18] using the Symns technic, obtained threshold readings varying considerably from those of Symns. He thought this variance was due to some difference in weight and temper of the shaft of their respective forks. He, like Symns, found in tabes a decided decrease in vibratory acuity over the sacrum; he termed this decrease the "sacral dip."

Piercy[19] used the same technic and his observations agree well with those of Wood. He noted that vibration perception in pernicious anemia was reduced. Six patients over sixty-five years old had total absence of vibration sense over the sacrum. He said this might be due to sclerosis of the nutrient arteries of the posterior roots and posterior columns of the cord with secondary degeneration of the nerve fibers.

Ahrens[20] also used the Symns' method of testing. He said of the vibratory threshold that it was difficult to determine exactly when a stage of very slight sensation merged into a stage of absence. He, like Symns and Wood, noted that vibratory acuity over the sacrum is decreased in tabes. He also observed that the majority of persons showed an increased sensation in the

upper extremities as compared with the lower, and that commonly the sensation was felt longer on one side of the body than on the other. Seventeen pernicious anemia patients were tested; those with subacute combined degeneration had early a marked decrease in vibratory sensation over the lower extremities, anterior superior iliac spine and sacrum.

Epstein[21] said constant initial amplitude of vibration could be obtained by striking the tuning fork so the prongs would click audibly. Duration of perception was computed in seconds from the click of the prongs. Given points were compared with their opposite homologs.

Pearson[22] studied the effect of age on vibratory sensibility. He used an ordinary tuning fork having 128 vibrations per second, a length of 16.5 centimeters and a base 4 by 5 millimeters square. The technic was to strike the fork, apply it to the patient and have him designate the instant it stopped vibrating. The length of time vibrations were felt was measured with a stop watch. He found in all cases tested a progressive age decrease in vibration sense over the lower extremities; the decrease was marked after the age of fifty. He said decreased vibratory acuity results from diminished blood supply to Goll's column due to spinal arteriosclerosis.

McKinley[23] devised a fork which could be rested with a constant pressure on the point to be tested. Small metal rods, of known lengths, were placed between the prongs of the fork. Quick withdrawal of a rod will cause an initial vibration of the prongs corresponding closely to the spread produced by the rod. He observed that "the more forcibly the fork is started, the more rapidly it runs down at first, whereas it will continue to vibrate at a relatively small amplitude for a rather long period of time."

It is evident, therefore, that in the usual clinical methods of testing vibration sense, the patient has too short a time in which to feel the higher amplitudes. A fork whose amplitude of vibration may be kept constant is necessary for quantitative estimation of vibration sense. Following the suggestion of McKinley the apparatus described in this paper was constructed in 1928; subsequent time has been devoted to its utilization.

THE APPARATUS

The apparatus consists essentially of a tuning fork with a rate of 120 double vibrations per second, the vibrations being sustained at any desired amplitude by a magnetic flux set up in a coil secured in position between the prongs of the fork. The coil is energized by a sixty cycle alternating current. A suitable means of regulating this current to desired values is provided, as well as adequate metering equipment for quantitatively measuring this exciting current, and from it determining the amplitude.

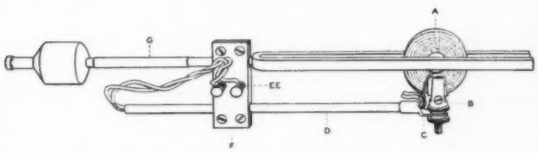

Fig. 1. Diagram of tuning fork used in this study.

The Tuning Fork.—The tuning fork illustrated in Figure 1 is 35.9 centimeters in length over all. It has a vibration rate of 120 per second; the rate was calibrated by the Waverly Musical Products Company of Long Island City, New York. The coil (A) is constructed of double cotton-covered enameled No. 20 copper wire, there being 121 turns of the wire in the coil. The coil is 4.33 centimeters in diameter and 0.80 centimeters in width; in its center is an iron core 1.38 centimeters in diameter. The distance between the prongs of the fork is 1.37 centimeters; this gives a clearance on each side of the coil of 0.285 centimeters and a possible maximum amplitude of vibration of 0.57 centimeters. The center of the core is placed 6.6 centimeters above the upper margin of the arch of the prongs of the fork and 12.0 centimeters below the tip of the fork, the distance from arch to tip being 18.6 centimeters and from arch to contact flange at the base of the fork being 17.3 centimeters.

The coil (A) is clamped into a slotted brass rod (B), which has a threaded shank. This shank, in turn, passes through a lug (C), which is soldered to the end of the supporting cylindrical brass tube (D), and is held in place by suitable lock nuts. The connections from the coil to the terminal posts (EE) are made of silk-covered No. 20 enameled wire and are conducted through this brass tube (D), which has an outside diameter of 0.6 centimeters. A quarter of a centimeter below the lower margin of the arch of the fork and at right angles to the shank of the fork is

a slotted bakelite clamp (F) 6.0 centimeters long, 2.4 centimeters wide and 1.2 centimeters thick, through which extend the shank of the fork and the brass tube, the shank and tube being secured in place by two screws at each end of the clamp. There is a circular mark upon the brass tube and also upon the shank of the fork at the levels where they enter and leave the clamp. These marks serve as guides to insure the constant vertical position of the coil. The base of the fork is weighted so that the complete fork weighs 500.3 grams. About the shank of the fork below the clamp is a brass collar (G) through which the shank is freely movable so that the examiner may hold the fork in a vertical position allowing it to rest with a weight of close to 500 grams upon the particular point of the body to be tested. The circular contact flange of the base of the fork, which rests against the patient, is 1.0 centimeter in diameter.

From the terminal posts (EE) in the clamp (F) extend leads of silk-covered enameled No. 20 copper wire, of convenient length, to their points of connection to the current supply devices and the metering equipment which are contained in a carrying case provided for the apparatus.

Current Supply.—The fork was constructed to have 120 double vibrations per second in order that it might synchronize with the sixty cycle alternating current commonly found in the electric light supply systems of American cities. The current supply consists of a "Jefferson Midget Toy Transformer" of seventy-five watt capacity. The secondary winding of the transformer is so tapped that a voltage range from one to twenty-two volts is covered in one-volt steps by the use of two tap switches connected as shown in Figure 2. In order to make the voltage continuously variable to any desired degree between taps, an inductance coil with a movable laminated iron core is connected in series with the leads to the tuning fork.

Inductance Coil.—The inductance coil consists of 218 turns of No. 16 double cotton-covered wire wound on a fiber tube 1.6 centimeters in outside diameter. The movable core consists of a bundle of soft iron wire 13.5 centimeters in length, secured into brass end caps, and has a diameter such that it makes a snug sliding fit into the fiber tube on which the wire is wound. The coil is 12.30 centimeters in length and 2.72 centimeters in outside diameter. This inductance coil is mounted in the cover of the carrying case to remove its stray magnetic field as far as possible from the metering equipment.

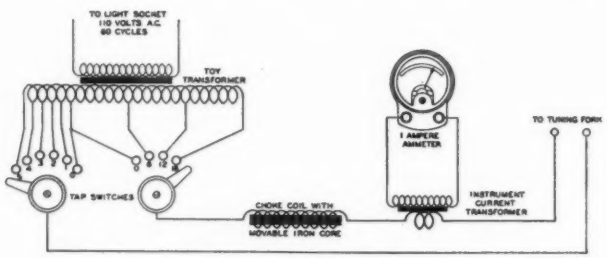

Fig. 2. Wiring diagram of apparatus.

Metering Equipment.—In order to determine what current metering equipment was necessary for use with the tuning fork, experiments were made on several normal persons to find the least value of amplitude which could be perceived. A one ampere ammeter was used for this purpose, and connected in series with the fork, from which it appeared that the minimum current value required would be approximately 0.4 amperes. A ten ampere ammeter was then connected in series with the fork and the maximum current which the apparatus could carry was found to be 8.0 amperes.

The scale of an alternating current ammeter ordinarily is not of uniform divisions but is divided in proportion to the square of the current, thereby affording the greatest accuracy of reading in the upper portion of the scale, where the intervals between scale divisions are larger. Since values from about 0.4 to 8.0 amperes were required to be read accurately, it became necessary either to use three separate ammeters to cover the range sufficiently, or to use one am-

meter with some suitable multiplier. The Weston one ampere ammeter, model No. 528, and Weston current transformer, model No. 539, satisfied these requirements.

The current transformer has on its top a ratio adjusting switch which gives current ratios of 2:1, 5:1, 10:1, or 20:1 between primary and secondary where the secondary current is always one ampere for a full scale deflection of the meter. Thus the lowest values can be easily read with the 2:1 ratio and the highest with the 10:1, all on a single one ampere ammeter.

The apparatus has been assembled into a carrying case as shown in Figure 3, the case having outside dimensions of 40.0 by 22.0 by 22.4 centimeters, and a total weight of 7.28 kilograms.

Calibration.—It was necessary to measure the amplitude of vibration of the fork as a function of current in the coil, from which a calibration curve could be drawn, and also to determine the mathematical relation existing between the two variables.

Measurement of the Amplitude.—The fork was made secure in a horizontal position. The amplitude of vibration was observed through a microscope having an eyepiece micrometer. A beam of light from an arc lamp was concentrated through a condensing lens upon a tiny sharp mark scratched on the tip of the tuning fork prong. The position of the edge of the mark was noted against the eyepiece scale in the microscope when the fork was at rest. Then when the fork was set into vibration the mark appeared to spread out and form a brilliant line (*mn*, Fig. 4), the length of which was easily measurable in the microscope. It was noted, by means of an Eastman timing clock, that twenty seconds were required for the line *mn* to become stabilized.

In order to obtain the greatest possible magnification of this apparent amplitude of vibration of the fork, and yet keep the position of *n* within the scale of the micrometer in the eyepiece so that the amplitude might be read, it was found that at 160 millimeter tube length, sixteen millimeter and thirty-five millimeter objectives and a 10 x eyepiece were needed. Accordingly, the eyepiece micrometer was calibrated against a stage micrometer for each of these two magnifications. Measures of the amplitude of vibration of the tip of the prong of the fork were then made for given current values, which were read from the Weston ammeter, at close intervals through the working range of the apparatus.

Calibration Curve.—The amplitude of prong vibration was plotted as a function of the exciting current in logarithmic coördinates (Fig. 5). The points lie essentially in a straight line; it is

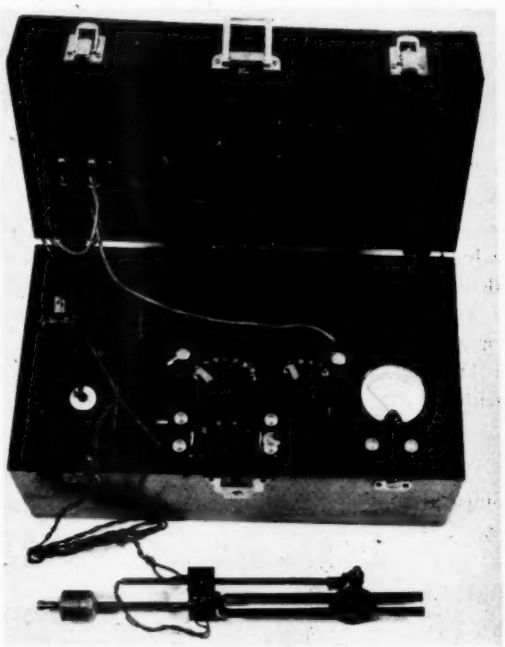

Fig. 3. Assembled apparatus.

Fig. 4. See section on Calibration.

easily seen which of the observed readings are in error. This line has an inclination of sixty degrees with the horizontal, which has a distinct bearing on the determination of the mathematical law of behavior of the apparatus.

Determination of Behavior of Apparatus.—The slope of any line is defined as the tangent of the angle which the line makes with the X axis or with any line parallel to the X axis. Assume a line FG as in Figure 6, which has a slope *m* and which passes through the point P_1 (coördi-

nates a, b). Let P(x, y) be any other point on the line. The slope of the line FG is $\frac{y-b}{x-a}$, which by hypothesis is equal to m, or tan ø. Then $\frac{y-b}{x-a} = m$ is an equation which holds true for all points on the line (P having been taken as any point on the line) and for no other points, and is, therefore, the equation of the line.

Now consider the data which have been found to determine a straight line when plotted in logarithmic coördinates. It is to be remembered that the coördinates numbered along the axes do not represent uniform divisions but do represent divisions proportional to the logarithms of the respective numbers indicated. Therefore, any value Y in logarithmic coördinates is the equivalent of the log of the corresponding value y in uniform coördinates, or $Y = \log y$, $X = \log x$, etc.

The equation of the straight line in the logarithmic coördinates is

$$\frac{Y-B}{X-A} = m \text{ or } Y - B = m\ (X - A).$$

Substituting in this equation, $Y = \log y$, $X = \log x$, etc.,

$$\log y - \log b = m\ (\log x - \log a),$$

$$\log \frac{y}{b} = m\ (\log \frac{x}{a})$$

$$\log \frac{y}{b} = \log (\frac{x}{a})\ m$$

This is the equation of the line as expressed in terms of uniform coördinates. Into this general equation, values of a and b as determined from the experimental data may be substituted to solve for the definite numerical equation which satisfies the data. The value of m in this substitution is the slope of the line as plotted in logarithmic coördinates. This line has an inclination of sixty degrees from the horizontal so the slope is tan sixty degrees or $\sqrt{3}$. Any point on the line may be taken for its values of a and b; for example, the point (0.84, 0.058) is taken here.

$$\frac{y}{0.058} = \frac{x}{(0.84)} \quad 1.732$$

$$y = 0.078\ x\ \sqrt{3}$$

where y is the amplitude of vibration in millimeters and x is the exciting current in amperes.

This is the final equation for the law of behavior of the apparatus and the equation is true for all values which lie on the line. The constant 0.078 is fixed by the design of the fork and would be changed if the fork or the coil or their relative positions were in any way altered. The fundamental relation, $y = K\ x\ \sqrt{3}$, would remain in any event but would require a new calibration for the determination of the new value of K.

Discrepancies in data at the higher values.—The projection of the calibration curve to the higher values of current and amplitude appears in the upper left quadrant of the graph (Fig. 5). The amplitude as shown by the laboratory data is seen to start increasing at a slightly lower rate than the current. This is due to the magnetic saturation curve of the iron core of the exciting coil. The flux in magnetic materials varies directly with the magnetomotive force or with the ampere turns at low flux densities, as shown in Figure 7, until the material begins to reach a point of magnetic saturation. At that point, commonly called the knee of the saturation curve, a greater magnetomotive force is required to force through additional flux, until finally at complete saturation no additional magnetomotive force can increase the flux further.

This apparatus has been so designed that, through the usual working range of amplitude desired, the iron core is worked below the knee of the saturation curve and hence, for practical purposes, the flux is directly proportional to the current in the coil, allowing the saturation curve to be neglected in the calculations.

Calculation of Thresholds.—The current in amperes necessary to excite appreciable vibrations of the prongs of the fork was calculated by multiplying the ammeter deflection by the current ratio. Thus, if the ammeter reading was 0.6 and the ratio of current through the transformer 5:1, the exciting current was $5 \times 0.6 = 3.0$ amperes. The amperes of current (3.0) being known, one can read directly from the calibration curve (Fig. 5) the amplitude of vibration of the prongs of the fork, in this case 0.516 millimeters.

Obviously, the amplitude of vibration in millimeters is the numerical expression of the vibratory sense threshold; the greater the fork vibrates before the vibrations are perceived the higher the threshold value. This assumes that the

base of the fork vibrates in proportion to the tip of the prongs of the fork. An attempt was made to measure the vertical amplitude of vibration of the base of the fork. Microscopic observation of the base, at a magnification of 400 diameters, shows the base to be moving elliptically rather than vertically. Further, the long diameter of this ellipse is not exactly in the longitudinal axis of the fork. In spite of the rather complicated and disturbing behavior of the base, as seen under the high magnification necessary, it is hardly conceivable that the base of the fork does not vibrate in proportion to the prongs. For the purposes of this study the assumption is made that the base does vibrate proportionately to the prongs, though it is admitted that a measure of vibration of the base could not be made and a search of the literature reveals no proof on this point.

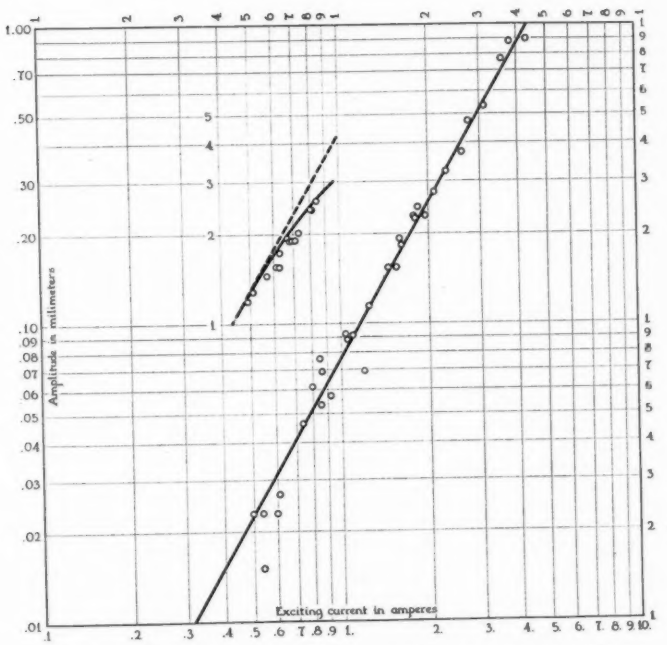

Fig. 5. Calibration curve in logarithmic coördinates; reference graph for determination of thresholds.

The greatest amplitude of vibration at the tip of the prongs of the fork which this apparatus is capable of generating, without striking the pole piece, is 2.80 millimeters. As the inductance coil becomes heated the resistance in the circuit increases. The current flowing through the apparatus decreases and the amplitude of vibration of the prongs of the fork consequently becomes

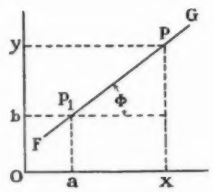

Fig. 6. See section on Determination of behavior of apparatus.

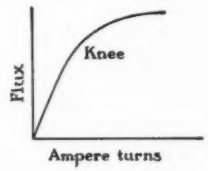

Fig. 7. See section on Discrepancies in data at the higher values.

TABLE I. THRESHOLDS IN NORMAL INDIVIDUALS IN TERMS OF MILLIMETERS OF AMPLITUDE OF PRONG OF TUNING FORK

Case No.	Diagnosis	Sex	Age	Height Inches	Weight Pounds	Arterio-sclerosis	Lateral epicondyle humerus		Styloid process ulna		Dorsum 2nd phal. 3rd digit		Ant. sup. iliac spine		Med. surface tibia		Lat. malleolus fibula		Sternum	C VII Spine	T VI Spine	T XII Spine	Sacrum	Post. thigh Left
							Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left						
1	Causalgia	M	13	60	83	0	0.035	0.021	0.039	0.031	0.052	0.039	0.052	0.045	0.061	0.047	0.052	0.052	0.021	0.088	0.076	0.098	0.104	0.350
2	Sinusitis	M	15	58	75	0	0.052	0.039	0.047	0.052	0.039	0.035	0.104	0.071	0.098	0.088	0.093	0.104	0.056	0.173	0.275	0.403	0.137	0.860
3	Mastoiditis	F	16	65	123	0	0.118	0.137	0.104	0.104	0.052	0.071	0.237	0.213	0.166	0.173	0.137	0.152	0.088	0.173	0.166	0.137	0.350	1.620
4	Mastoiditis	F	23	64	111	0	0.130	0.112	0.076	0.093	0.061	0.045	0.275	0.180	0.130	0.188	0.173	0.159	0.082	0.376	0.430	0.300	0.895	2.340
5	Normal person (Intern)	M	24	63	151	0	0.096	0.098	0.039	0.063	0.021	0.041	0.255	0.255	0.221	0.229	0.169	0.169	0.024	1.460	0.975	0.936	1.658	1.070
6	Retroversion	F	25	68	118	0	0.376	0.112	0.220	0.118	0.275	0.152	0.546	0.321	0.229	0.237	0.220	0.213	0.166	0.403	0.321	0.583	2.186	2.340
7	Hernia	M	36	69	155	0	0.350	0.180	0.173	0.104	0.104	0.112	1.023	0.860	0.245	0.255	0.204	0.265	0.130	0.748	0.610	0.350	1.620	2.340
8	Sinusitis	M	37	69	180	0	0.196	0.173	0.066	0.088	0.043	0.052	0.255	0.486	0.213	0.180	0.321	0.220	0.137	0.275	0.350	0.403	0.860	2.340
9	Cataract	M	40	66	175	0	0.173	0.130	0.118	0.076	0.076	0.052	0.430	0.376	0.300	0.220	0.275	0.255	0.082	0.458	0.350	0.350	0.458	2.340
10	Eye trauma	M	41	65	128	0	0.300	0.288	0.166	0.180	0.173	0.152	0.825	0.711	0.458	0.679	0.546	0.430	0.245	1.070	0.936	0.860	0.679	2.340
11	Herniotomy	M	41	62	122	0	0.403	0.229	0.180	0.180	0.144	0.047	0.275	1.620	0.255	0.486	0.516	0.430	0.123	0.430	2.023	0.376	2.340	2.340
12	Endometritis	F	43	66	120	0	0.188	0.137	0.137	0.144	0.104	0.093	0.546	0.679	0.403	0.430	0.321	0.610	0.104	0.785	1.023	1.213	1.696	2.340
13	Myoma-uterus	F	44	66	154	0	0.255	0.204	0.275	0.098	0.321	0.061	0.860	0.516	0.644	0.825	1.136	0.860	0.144	1.250	2.340	1.380	2.340	2.340
14	Hemorrhoids	F	44	67	116	0	0.118	0.173	0.144	0.052	0.052	0.031	0.213	0.376	0.173	0.275	0.156	0.233	0.104	0.860	0.255	0.173	1.180	0.644
15	Perineal repair	F	47	69	136	0	0.213	0.076	0.088	0.061	0.066	0.039	0.546	0.350	0.430	0.204	1.320	0.213	0.088	0.350	0.679	0.403	0.679	1.250
16	Duodenal ulcer	M	50	68	153	0	0.220	0.115	0.166	0.093	0.204	0.118	1.100	1.380	0.152	0.144	0.159	0.137	0.079	1.136	0.825	0.679	0.486	2.340
17	Sinusitis	M	52	70	157	0	0.204	0.220	0.152	0.130	0.166	0.104	0.610	0.516	1.860	0.895	1.070	0.300	0.144	1.250	1.250	0.516	2.340	2.340
18	Asthma	M	53	68	152	sl.	0.144	0.104	0.112	0.144	0.082	0.039	0.486	0.403	0.403	0.458	0.156	0.255	0.088	0.403	0.403	0.458	1.180	1.620
19	Hyper. prostate	M	56	72	153	mod.	0.321	0.245	0.213	0.255	0.430	0.895	1.250	1.213	1.950	2.110	1.620	1.773	0.204	1.320	1.180	0.936	2.340	2.340
20	Bladder stone	M	56	68	165	0	0.255	0.229	0.188	0.166	0.152	0.137	1.620	1.250	1.620	2.023	0.516	0.860	0.098	1.213	0.644	0.936	1.320	2.340
21	Cataract	M	58	70	161	sl.	0.860	0.300	0.120	0.120	0.144	0.063	2.340	1.180	1.696	1.100	1.860	1.380	0.120	0.895	2.340	0.711	2.340	2.340
22	Cataract	M	58	65	131	0	0.486	0.245	1.100	0.204	0.516	0.245	2.023	0.860	1.950	2.340	2.340	2.340	0.275	2.340	2.186	1.620	2.340	2.340
23	Cataract	M	58	71	169	sl.	0.112	0.130	0.137	0.152	0.047	0.052	1.023	0.583	0.679	0.516	1.070	0.748	0.066	0.350	0.255	0.430	1.620	2.340
24	Simple thyroid adenoma	F	59	60	148	0	0.311	0.255	0.275	0.376	0.255	0.300	2.340	1.620	0.895	0.785	0.597	0.936	0.679	2.340	2.110	1.696	2.340	2.260
25	Cataract	M	60	66	125	0	0.233	0.516	0.213	0.679	0.104	0.237	2.340	2.340	0.546	1.180	2.340	2.340	0.137	2.340	0.748	0.430	2.340	2.340
26	Otitis media	M	62	67	147	sl.	0.403	0.350	0.166	0.130	0.104	0.098	1.536	2.023	1.460	1.285	1.950	1.620	0.213	0.936	0.748	0.516	2.340	2.023
27	Cataract	M	67	68	171	0	0.237	0.098	0.156	0.093	0.135	0.173	0.975	0.860	0.825	0.936	1.250	1.100	0.144	1.950	2.340	1.620	2.260	2.260
28	Glaucoma	M	68	64	120	mod.	0.516	0.173	0.166	0.093	0.196	0.104	1.136	0.679	0.825	0.403	0.748	0.376	0.220	2.340	2.340	1.620	2.340	2.340
29	Cataract	M	68	64	117	sl.	0.220	0.245	0.137	0.403	0.173	0.123	2.340	2.340	0.300	0.583	0.229	0.516	0.204	1.320	1.773	0.895	2.340	2.340
30	Gastric ulcer	M	71	72	139	mod.	0.229	0.275	0.180	0.204	0.188	0.159	2.340	1.620	2.340	2.340	2.340	2.340	0.173	1.460	0.516	0.644	2.340	2.340
31	Glaucoma	M	72	69	115	sl.	0.180	0.130	0.229	0.130	0.204	0.066	0.975	0.275	1.070	0.860	1.620	1.136	0.144	1.620	1.320	0.516	2.340	2.340
32	Cataract	M	73	64	142	sl.	0.213	0.173	0.159	0.137	0.220	0.173	0.403	1.100	1.100	0.785	2.186	2.023	0.104	2.100	1.620	0.376	2.340	2.340
33	Cataract	M	74	72	196	sl.	0.376	0.255	0.321	0.166	0.275	0.321	2.260	1.380	1.320	1.250	1.285	1.380	0.173	2.340	2.340	2.260	2.023	2.186
34	Cataract	M	81	70	170	sl.	0.159	0.130	0.144	0.156	0.237	0.245	0.486	0.376	2.023	0.785	2.023	0.825	0.144	0.486	0.679	0.458	1.696	2.340

0 = absent; sl. = slight; mod. = moderate.

TABLE II. PERTINENT CLINICAL DATA ON PERNICIOUS ANEMIA PATIENTS

TABLE II. PERTINENT CLINICAL DATA ON PERNICIOUS ANEMIA PATIENTS

Case No.	Subacute combined degeneration	Hg.	R.B.C. in millions	Biceps reflex		Triceps reflex		Patellar reflex		Achilles reflex		Great toe extension		Abdominal reflexes		Position sense, toes		Muscle pain, calves		Tendon pain, T. Achilles		*Tactile sense	**Paresthesia	**Edema
				R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L			
1	0	60	3.3	+	+	+	+	+	+2	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+
2	Present	86	....	+	+	+	+	+2	+	+	+	0	0	+	+	−1	−1	+	+	+	+	−1 feet	+	+
3	0	53	2.6	−2	−2	−1	−1	−1	−3	+	+	0	0	+	+	+	+	+	+	+	+	+	0	0
4	0	87	....	+	+	+	+	+2	+2	+	+	0	0	0	0	+	+	+	+	+	+	+	0	0
5	Present	83	4.0	+	+	+	+	−3	−1	0	0	+	+	−1	−1	−3	−3	+	+	−1	−1	−1 below knees	0	0
6	Present	88	4.5	+	+	+	+	+	+	+	+	0	0	+	−1	+	+	+	+	+	+	+	+	0
7	Present	43	1.6	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+
8	0	72	2.8	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	+	+	+	0	0
9	0	43	1.8	+	+	+	+	+	+	+	+	0	0	−1	−1	+	+	+	+	+	+	+	0	0
10	Present	50	2.6	+	+	+	+	+	+2	+	+2	0	±	+	+	−1	+	+	+	+	+	+	0	0
11	Present	50	1.6	−2	−2	−2	−2	+	+	−1	−3	0	0	+	+	−1	−1	+	+	+	+	−1 fingers	+	+
12	Present	80	2.7	+	+	+	+	+2	+2	+	+	0	0	+	+	−2	−2	+	+	+	+	−1 legs and forearms	+	0
13	Present	60	2.1	+	+	+	+	+2	+2	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+
14	Present	80	3.8	+	+	+	+	−1	0	0	0	0	0	0	0	+	+	+	+	+	+	−1 below knees	0	0
15	Present	93	3.7	+	+	+	+	+2	+2	+	+	±	+	−1	−2	−1	−2	+	+	+	+	−1 below knees and elbows	+	0
16	Present	83	3.7	+	+	+	+	−2	−2	−3	−3	0	0	−3	−3	−2	−1	+	+	+	+	−1 legs	+	+
17	0	70	2.9	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	+	+	+	0	0
18	Present	60	2.1	+	+	+	+	+2	+2	+	+	±	+	−2	−2	−3	−3	−1	−1	−1	−1	−1 below knees	+	0
19	Present	83	4.1	+	+	+	+	+2	+2	−3	−3	+	+	−1	−1	−1	−1	+	+	+	+	−1 below knees and elbows	+	+
20	0	57	2.2	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	+	+	+	0	0
21	Present	63	2.7	−2	+	−2	−2	−1	−2	−3	−3	0	0	−2	−3	+	−1	+	+	+	+	−1 below knees and wrists	+	0
22	Present	56	2.1	+	+	+	+	+2	+2	+2	+2	0	0	+	+	+	+	+	+	+	+	−1 below knees	+	+
23	Present	78	2.6	+	+	+	+	0	0	0	0	+	0	0	0	−1	−1	+	+	+	+	+	+	+
24	0	73	2.3	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	+	+	+	0	0
25	Present	70	2.9	+	+	+	+	−2	−2	−1	−1	0	0	+	+	−1	−1	+	+	+	+	−1 below elbows and mid thighs	+	+
26	Present	55	1.8	−1	+	+	+	−2	−3	−3	−3	±	0	+	+	+	+	+	+	+	+	+	0	0
27	0	89	4.4	+	+	+	+	−3	−3	−3	−3	0	0	0	0	+	−1	+	+	+	+	+	0	0
28	Present	50	2.0	+	+	+	+	+2	+2	+	+	0	0	−1	−1	+	+	+	+	+	+	+	+	0
29	Present	94	3.7	−1	−1	−1	−1	−3	−3	−3	−3	0	0	−1	−1	+	+	+	+	+	+	+	+	0
30	0	81	4.0	+	+	+	+	+	−1	−2	−2	0	0	+	+	+	+	−1	−1	−1	−1	+	0	+

Key to symbols: Present or normal = +; slightly increased = +2; moderately increased = +3; markedly increased = +4; slightly decreased = −1; moderately decreased = −2; markedly decreased = −3; absent = 0; ± = questionable.

*No patient had pain or temperature sense disturbance.
**Detailed distribution of paresthesias and edema in individual cases is indicated in Table III.

TABLE III. THRESHOLDS IN PATIENTS WITH PERNICIOUS ANEMIA IN TERMS OF MILLIMETERS OF AMPLITUDE OF PRONG OF TUNING FORK

Case No.	Sex	Age	Height Inches	Weight Pounds	Arteriosclerosis	Lateral epicondyle humerus		Styloid process ulna		Dorsum 2nd phal. 3rd digit		Ant. sup. iliac spine		Med. surface tibia		Lat. malleolus fibula		Sternum	C VII spine	T VI spine	T XII spine	Sacrum	Post. thigh Left
						Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left						
1	F	17	67	136	0	0.021	0.027	0.056	0.039	0.021	0.021	0.071	0.052	e 0.159	e 0.082	0.188	0.088	0.018	0.516	0.376	0.275	0.936	0.255
2	M	29	68	137	0	0.104	0.076	0.112	0.096	0.275	0.192	0.182	0.311	p 0.300	p 2.340	p 0.565	e, p 2.340	0.052	0.403	1.320	0.275	2.340	2.340
3	F	31	64	110	0	0.112	0.180	0.166	0.159	0.144	0.104	0.516	0.430	0.350	0.137	0.275	0.213	0.130	0.610	0.300	0.350	2.340	2.340
4	F	37	68	144	0	0.458	0.255	0.363	0.144	0.192	0.363	1.250	0.565	2.340	2.260	2.340	2.340	0.336	0.644	0.679	0.583	2.340	2.340
5	M	38	65	132	0	0.152	0.275	0.118	0.123	0.144	0.088	2.340	1.536	2.340	2.340	2.340	2.340	0.255	2.340	0.679	0.679	2.340	2.340
6	M	44	69	142	0	0.104	0.137	0.082	0.098	0.052	0.076	1.136	0.711	p 2.340	p 2.340	p 2.186	p 2.340	0.104	0.860	0.376	1.620	0.860	2.340
7	F	44	63	127	0	0.229	0.233	0.188	0.128	0.104	0.128	2.340	2.340	p 2.340	p 2.340	e, p 2.340	e, p 2.340	0.486	2.340	2.340	2.340	2.340	2.340
8	M	47	65	135	0	0.376	0.627	0.275	0.376	0.350	0.245	1.250	1.023	0.430	1.380	0.376	0.785	0.516	1.696	1.950	1.536	1.250	2.340
9	F	47	62	145	0	0.376	0.173	0.245	0.112	0.213	0.137	1.100	0.825	0.679	0.785	1.070	1.213	0.237	0.711	0.583	0.936	1.460	2.340
10	M	48	73	135	0	0.321	0.118	0.275	0.255	0.336	0.137	1.950	1.213	0.679	1.320	0.895	1.950	0.430	0.711	0.825	0.975	2.340	2.340
11	F	48	67	142	0	p 0.166	p 0.118	0.181	0.131	p 0.104	p 0.104	1.070	0.785	e, p 1.100	e, p 0.376	e, p 1.620	e, p 0.546	0.709	p 1.070	p 0.860	p 0.516	1.620	2.340
12	M	49	66	114	0	0.516	0.516	p 1.320	p 0.975	p 0.748	p 1.180	2.340	2.340	p 2.340	p 2.340	p 2.340	p 2.340	0.546	2.340	2.340	2.340	2.340	2.340
13	M	52	66	125	0	0.321	0.300	0.300	0.275	0.255	0.233	2.340	2.340	1.180	1.320	e 2.110	e 2.186	0.376	2.340	2.340	2.340	2.340	2.340
14	F	53	65	159	0	0.695	0.516	0.546	0.501	0.516	0.767	2.340	2.340	2.340	2.340	2.340	2.340	0.430	2.340	2.260	0.376	2.340	2.340
15	M	55	71	157	0	1.536	0.644	p 1.620	p 0.430	p 0.748	p 0.403	2.340	2.186	p 2.340	p 2.340	p 2.340	p 2.340	0.350	1.536	1.380	2.340	2.340	2.340
16	F	57	62	105	sl.	0.711	0.376	1.070	0.321	p 1.136	p 0.486	2.340	2.340	e 2.340	e 2.340	2.340	2.340	0.321	2.340	2.340	2.340	2.340	2.340
17	M	58	67	193	0	1.180	0.644	1.773	0.711	0.430	0.583	2.340	1.773	0.711	0.975	0.860	0.895	0.350	2.340	2.340	2.340	2.340	2.340
18	M	59	66	146	0	0.546	1.070	0.516	1.047	p 1.860	1.158	2.186	2.186	p 2.340	p 2.340	p 2.340	p 2.340	0.565	2.340	2.340	2.340	2.340	2.340
19	F	59	65	125	0	1.860	1.213	1.696	0.895	p 1.620	p 0.785	0.860	2.110	e 2.340	e 2.340	e, p 2.340	e, p 2.340	0.376	2.340	2.023	2.340	2.340	2.340
20	M	60	68	128	mod.	0.430	0.245	0.350	0.180	0.255	0.229	1.213	0.748	1.420	0.936	1.696	1.950	0.118	2.110	1.696	1.250	2.340	2.340

21	F	60	66	107	0	0.516	0.644	2.340	0.173	2.340	0.583	2.340	2.340	2.340	2.340	2.340	2.340	0.321	2.340	1.100	1.536	2.340	2.340
22	M	61	67	113	0	0.936	1.420	1.100	0.860	0.679	0.785	2.340	2.340	2.340	2.340	2.340	2.340	0.458	2.340	2.110	2.023	2.340	2.340
23	F	61	62	141	sl.	0.166	0.516	0.321	0.610	0.376	0.458	2.340	2.340	2.340	2.340	2.340	2.340	0.275	2.340	2.340	2.340	2.340	2.340
24	M	62	65	110	sl.	0.430	0.233	0.255	0.204	0.213	0.173	1.773	2.340	1.320	0.546	1.180	0.860	0.144	2.340	2.340	2.340	2.340	2.340
25	F	70	64	100	mod.	0.145	0.137	0.229	0.166	0.229	0.213	2.186	1.696	1.213	0.936	1.320	1.023	0.237	2.340	2.340	1.536	2.340	2.340
26	M	72	67	160	sl.	1.950	1.620	0.711	0.895	0.516	0.458	2.340	2.340	2.340	2.340	2.340	2.340	0.583	2.260	1.860	1.696	2.340	2.340
27	M	72	64	147	0	0.221	0.181	0.145	0.213	0.118	0.104	0.350	0.123	0.255	0.516	0.486	0.546	0.130	1.950	1.620	1.380	1.950	1.860
28	F	78	61	96	sl.	0.076	0.112	0.052	0.071	0.047	0.056	1.250	1.100	1.380	1.696	1.950	2.186	0.088	1.620	1.460	1.773	2.340	2.340
29	M	79	72	188	mod.	0.275	0.213	0.458	0.288	0.255	0.610	2.340	2.340	2.340	2.340	2.340	2.340	0.255	1.100	0.936	0.583	2.340	2.340
30	M	83	66	160	sl.	0.546	0.516	0.486	0.583	0.679	0.644	0.785	0.679	2.110	1.320	2.023	1.536	0.350	2.340	1.696	2.340	2.340	2.340

0 = absent; sl. = slight; mod. = moderate; e = edema; p = paresthesia

less. The greatest constant amplitude with this apparatus is 2.34 millimeters. This value therefore was taken as the upper limit of the threshold of vibratory acuity in this study.

CLINICAL TECHNIC

All patients examined were made comfortable in bed in a quiet room. The fork, vibrating sufficiently to be perceived well, was placed upon the sternum to acquaint the patient with the sensation to be tested. The fork was always placed vertically to the bone. It was necessary to wait twenty seconds after turning on the current before overtones in the fork had disappeared. The patient was asked to describe the sensation to make certain he was differentiating it from pressure of the fork. Several trial tests were made with the fork in vibration and at rest; the patient was requested to indicate when it was in vibration and when it was not.

Then the fork, vibrating at an amplitude estimated to be below the threshold of the point to be tested, was placed over the point. If the patient did not perceive the vibrations, the fork was lifted from the body surface and the current increased. After twenty seconds, the fork was reapplied to the body, care being taken to place it exactly on the same point as previously. The base of the fork left its circular imprint on the skin so it was relatively easy to replace it on the same site. The current was thus increased to the point at which the patient just perceived the vibrations for a period of ten seconds. An average of three readings over each point was taken as the threshold.

The patient was instructed to rest his extremities squarely upon the bed, that is, to relax. If he pressed down firmly on the bed he could often feel the vibrations in distal portions of an extremity before they were perceived in the proximal points. The patient's facial expression was frequently an indicator of his perception; the countenance would light up coincident with the recognition of the vibrations of the fork. The right half of the body was tested first, then the left half and finally the back. The current was turned off at intervals to test the patient's attention.

OBSERVATIONS ON NORMAL AND PERNICIOUS ANEMIA PATIENTS

For purposes of comparison, thirty-four normal individuals, ages thirteen to eighty-one years,

inclusive, were studied. They were all patients in the Minnesota General Hospitals; their complaints were strictly medical and their abnormalities did not involve the nervous system. A searching neurologic examination, performed by the writer, was negative in each case. Only persons of normal intelligence and apparently normal emotional balance were tested in this group. The conditions which brought the patients to the hospital are listed in Table I under the heading of Diagnosis.

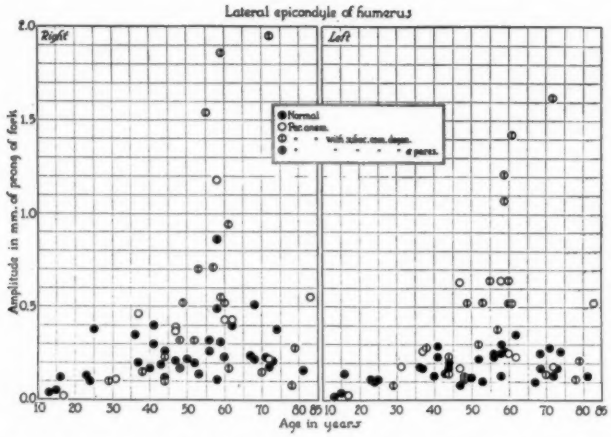

Fig. 8. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

Thirty other persons, ages seventeen to eighty-three years, inclusive, suffering from pernicious anemia, were studied. Fourteen of these persons were tested at the Boston City Hospital through the courtesy of Doctors Castle and Heath. Table II gives the clinical status of the pernicious anemia patients and indicates those having subacute combined degeneration. These patients were not selected to include or exclude neurologic complications. All patients tested, both normal and those with pernicious anemia, had negative blood Wassermann tests, some from two laboratories. The vibratory acuity over eighteen different points of the body was determined.

Tables I and III show the vibration sense thresholds of the points tested. The threshold values are computed from the amperes of exciting current, as described under Calculation of Thresholds. The patients examined are listed according to age as can be seen in column two of the tables. Such an arrangement was found convenient in constructing the threshold graphs (Figs. 8 to 16, inclusive).

The threshold graphs have been plotted as amplitudes of vibration of the free end of the prongs of the fork in millimeters along the ordinate against ages in years of the patients along the abscissa. Sexes are not differentiated in the graphs. Normal cases are shown as black dots, and pernicious anemia patients as open circles. A vertical line through the circle indicates that the patient also has subacute combined degeneration. A horizontal line signifies that he has paresthesias and the addition of an outer circle to the symbol denotes that he has edema at the point tested. This point is indicated at the top of each figure.

Certain general conclusions are immediately evident from a superficial inspection of the series of threshold graphs.

1. Younger people, in general, have lower vibration sense thresholds than older individuals.

2. There is a considerable spread in the thresholds over all points tested, both in the normal and pernicious anemia patients.

3. In general, vibratory acuity is somewhat reduced in pernicious anemia.

4. A large number of patients, both normal and pathological, have thresholds above 2.34 millimeters.

(5) More pernicious anemia patients with than without subacute combined degeneration have thresholds above 2.34 millimeters. These

observations and individual differences therefrom will not be discussed.

The vibratory perception of all patients, both normal and those with pernicious anemia, was slightly more acute in the left side of the body than in the right, except over the medial surface of the tibia and the lateral malleolus of the fibula, where the pernicious anemia patients had better perception on the right. Three normal persons (Cases 9, 15 and 21) had better perception in the entire left half of the body than in the right; the reverse was never observed, either in normal or pathological cases. All the patients were right-handed; consequently, no correlation between the right or left-handedness and vibratory acuity on the respective sides of the body could be shown in this series of cases. In all patients where the readings over the extremities, either upper or lower, were approximately equal on the two sides, the thresholds were high.

The lateral epicondyle of the humerus (Fig. 8) is a difficult point to test. The fork easily slides off the bony prominence; this slight trauma to the tissues sometimes causes the patient discomfort and so may interfere with good reception of vibratory stimuli. No patient had a threshold above the working range of the apparatus. The greatest individual reduction in vibratory acuity in both the normal and pernicious anemia patients was on the right. One patient only had paresthesia. His vibratory acuity was better than the average normal or pernicious anemia patient tested. Over both humeri the threshold of several pernicious anemia patients exceeded the highest normal threshold. Most of these pernicious anemia patients were those who had subacute combined degeneration. No edema was present over the lateral epicondyle.

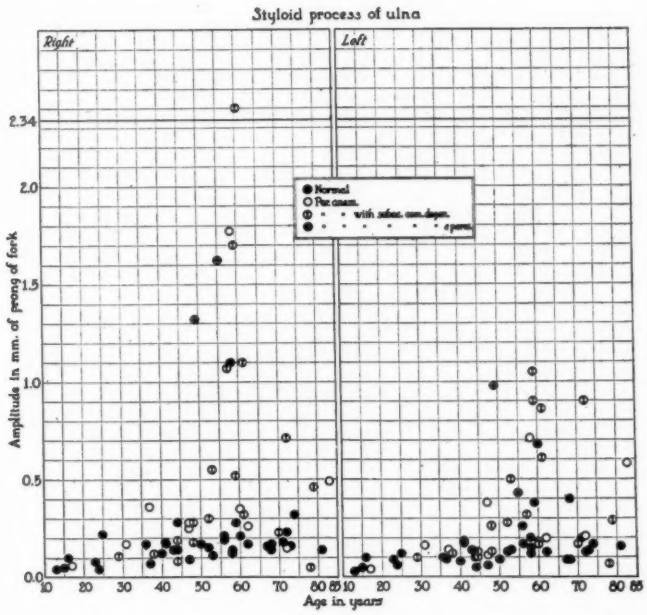

Fig. 9. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

Similar observations were made in the readings over the *styloid process of the ulna* (Fig. 9). In the normals the thresholds over the right and left styloid processes were more nearly equal than in the case of the right and left lateral epicondyles. Several pernicious anemia patients had thresholds higher than any normal patient. As over the lateral epicondyles, pernicious anemia patients past fifty years of age had the highest thresholds. The threshold of one individual exceeded the working range of the apparatus. Of the five pernicious anemia patients who had greater reduction in their vibratory acuity over the styloid process of the right ulna than the

greatest reduction in any normal individual, four had subacute combined degeneration. Two of the four also had paresthesias. Of the left side, six patients with pernicious anemia had thresholds higher than any normal persons tested. Of these six, five had subacute combined degeneration, and of these five, one had paresthesia. No patient tested had edema over the styloid process.

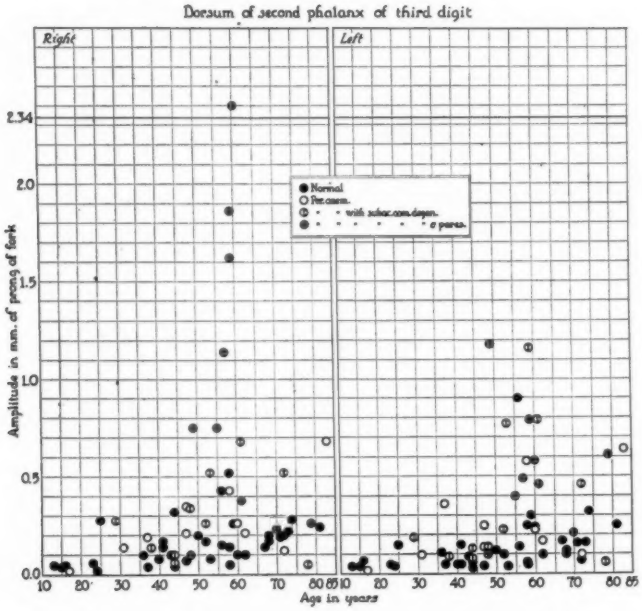

Fig. 10. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

The normal thresholds over the *dorsum of the second phalanx of the third digit* of the hand (Fig. 10) were more scattered than over the epicondyle or styloid process. But the average normal threshold was lower than on any other point tested. The highest individual normal threshold was on the left side, but the average threshold on the left was definitely lower than on the right. Of the right side of the eight pernicious anemia patients whose thresholds were higher than the highest normal, seven had subacute combined degeneration. Of these seven, six had paresthesias. One pernicious anemia patient with paresthesia had a threshold above the greatest constant amplitude of the apparatus. Regularly, over all points tested, where paresthesias were present the patients experienced difficulty in determining their exact vibratory perception thresholds. Usually the paresthesia increased the threshold, though occasionally it seemed to the patient that the fork would be vibrating when it had an amplitude below the average normal. No patient tested had edema in either hand.

The *anterior superior iliac spine* (Fig. 11) was a very difficult point to test accurately, as the site is a small, irregular and rather insecure resting place for the base of the fork. Further, due to the overlying abdominal soft parts, it was often almost impossible to place and maintain the fork vertically. There was considerable spread in all thresholds, especially in the normal individuals. On the average, there was a tendency to a decrease in vibration acuities with increasing age. This tendency was more definite in the pernicious anemia patients. Thirteen pernicious anemia patients did not feel the fork vibrating at its greatest constant amplitude, 2.34 millimeters, over the right iliac spine. Eleven did not feel it over the left side. Only one patient not perceiving it on the right, and one on the left, did not have subacute combined degeneration. But several of them had as good vibration sense as the normals in their respective age group. All patients were free from paresthesias and edema in this site.

The *medial surface of the tibia* (Fig. 12), tested midway between the knee and ankle joints, and the lateral malleolus of the fibula, which will be discussed later, gave the most interesting and valuable reading. This is an excellent resting place for the base of the fork. Even on the surface of this bone, however, there are irregularities; before placing the fork the area was palpated slightly to locate the smoothest site. Normal individuals showed a definite tendency toward a progressive decrease in vibratory acuity with age; the decrease was particularly noticeable after the age of forty. This observed decline in vibration sense agrees with quantitative estimations made by Pearson.[22] Only one normal person was unable to perceive the vibration at 2.34 millimeters over the right tibia, and two over the left tibia. In general, patients with pernicious anemia had a much greater reduction in vibratory perception than normal patients, but several pernicious anemia patients had lower thresholds than normal persons of the same or earlier ages. Fifteen of the thirty pernicious anemia patients were unable to feel the fork at its greatest constant amplitude over each tibia. In every case, except one, this loss occurred in patients with subacute combined degeneration. The tibia, therefore, showed a definite relation between loss or severe decrease in vibratory sensibility and cord changes associated with pernicious anemia. Paresthesias were quite common and might have been a factor in the high tibial thresholds. Edema, which was present in some degree over the tibia in six cases, did not seem to exert much, if any, dampening effect on the vibration reception.

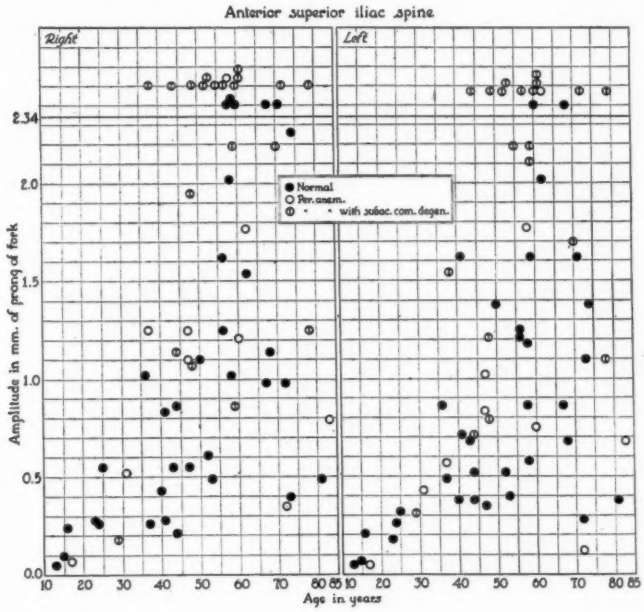

Fig. 11. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

The *lateral malleolus of the fibula* (Fig. 13), like the tibia, showed a progressive age decrease of vibratory sensibility in the normal patients. Three normal individuals were unable to feel the vibration at 2.34 millimeters on the right, and a like number on the left lateral malleolus. Thirteen of the thirty pernicious anemia patients were unable to feel the vibrating fork over the right lateral malleolus; sixteen were unable to feel the fork over the left lateral malleolus. All these twenty-nine patients whose thresholds were above the working range of the apparatus had subacute combined degeneration except two. Of the thirteen pernicious anemia patients who were unable to feel the vibration on the right side, five had paresthesias; of the sixteen on the left, eight had paresthesias. Paresthesias, therefore, appeared to be definitely as-

sociated with decrease in vibratory acuity over the lateral malleoli. Edema was more common in those pernicious anemia patients who did not feel the greatest constant vibration than in the case of the tibiæ. Some individuals with edema had vibratory thresholds lower than normal individuals and so it cannot be said that edema itself causes reduction in vibratory perception.

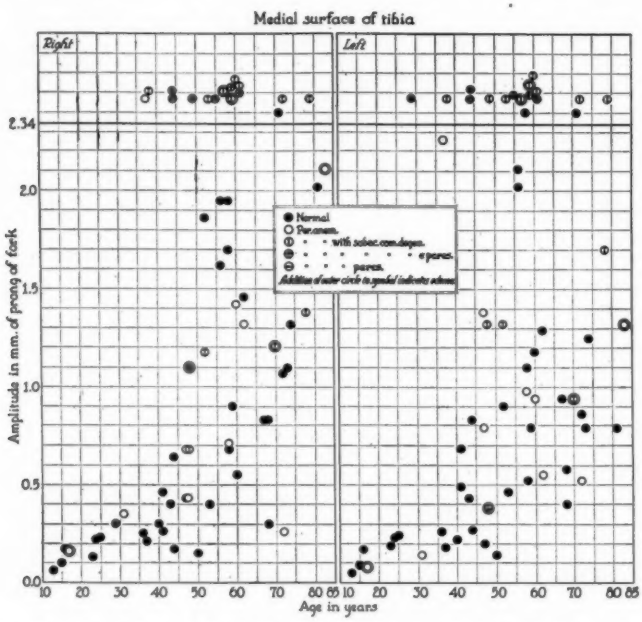

Fig. 12. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

The readings obtained over the *body of the sternum* at the level of the third rib (Fig. 14) were nearly constant for all ages in the normal patients. The thresholds were low and the average value only slightly higher than over the left third digit. One normal person had a threshold practically as high as any pernicious anemia patient. This person, fifty-five years of age, had a slight deformity of the body of the sternum opposite the second intercostal space; the deformity may account for the decline in perception. Patients with subacute combined degeneration had thresholds which were, for the most part, slightly higher than those without subacute combined degeneration. No paresthesias or edema were present over the sternum. Vibration sense loss over the sternum would appear to have more significance than over any other point tested.

The *posterior thigh* at its mid point (Fig. 14) was taken as the testing point to determine any effect heavy soft tissue layers would have on vibratory reception. Of the physiologists, von Frey[24] in particular, insists that vibration sense is received only in the skin, the bone acting as a resonator. In all cases, the thigh showed the greatest reduction in vibratory sensation of any point tested. Twenty-three of the thirty-four normal patients and twenty-eight of the thirty pernicious anemia patients were unable to feel the vibration at the maximum constant amplitude of the fork. In spite of relatively high thresholds as a group, the youngest normal and the youngest pernicious anemia patients had reasonably low thresholds. Neither of the two pernicious anemia patients who were able to perceive the vibration had subacute combined degeneration. None of the patients tested had either paresthesias or edema over this region.

In testing the *spine*, the fork was applied vertically to and upon the spinous processes; the patient lay on his left side with the anterior surface of his body at an angle of approximately forty-five degrees from the plane of the bed. The insecure position of the fork, due mainly to spinous process irregularities, made the vertebræ, like the lateral epicondyle of the humerus and

the iliac spine, difficult points to test. Also, over the vertebræ tested (C VII, T VI, T XII) especially over the seventh cervical, the patients had difficulty in differentiating auditory from vibratory sensation. Over the sixth thoracic vertebra, the same difficulty was occasionally encountered, than those without degenration of the spinal cord.

One person (Case 11), aged forty-eight, had paresthesia; his threshold was no higher than others of his age. No person had edema over this vertebra.

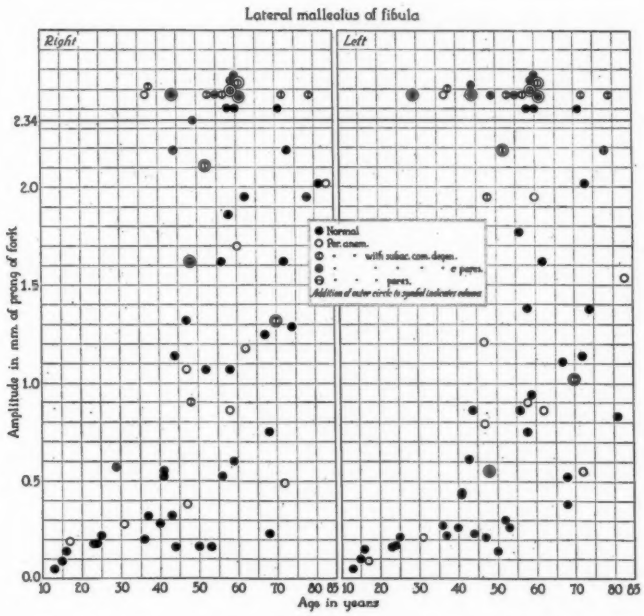

Fig. 13. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

the thoracic cavity possibly acting as a resonator. The vibratory sensibility over the seventh cervical and sixth thoracic vertebræ might conform to Neutra's[11] conception of the sensation as an osteoacusis. However, no patient was perplexed in his sensation over the sternum. Only one pernicious anemia patient (Case 11) had paresthesia in the vertebral region.

The *spinous process of the seventh cervical vertebra* (Fig. 15) gave very irregular findings both in the normal and pernicious anemia patients. Over this vertebra, as over the iliac spine, the tibia and fibula, there was somewhat of a tendency toward a progressive age decrease in vibratory acuity both in the normal and pernicious anemia patients. More pernicious anemia than normal patients did not feel the vibration at 2.34 millimeters amplitude. As was true over other points tested, there were more pernicious anemia patients with subacute combined degeneration whose thresholds were above 2.34 millimeters

The *spinous process of the sixth thoracic vertebra* (Fig. 15) also showed great spread in thresholds. Five normal persons, the same number as over the seventh cervical vertebra, had thresholds above the working range of this apparatus. Only nine pernicious anemia patients had thresholds in excess of 2.34 millimeters over this vertebra as compared with fourteen over the seventh cervical vertebra. Persons with subacute combined degeneration showed more loss of vibratory acuity than those without combined system disease, though, again, several had thresholds below the normal. The forty-eight year old pernicious anemia patient with paresthesia had a threshold below the average normal. No person tested had edema over this area.

Vibratory acuity over the *spinous process of the twelfth thoracic vertebra* (Fig. 16) was better than over the other two vertebræ tested. The normal readings tended to be lower in all ages and the average normal was distinctly lower. No

normal individual had a threshold exceeding 2.34 millimeters. Eleven of the patients with pernicious anemia had thresholds at or above 2.34 millimeters. Eight of these eleven had subacute combined degeneration. The threshold of the forty-eight year old patient with paresthesia was

Taken as a group (Fig. 17), the areas tested in the upper extremity and the sternum had the lowest average normal thresholds. A complete or very severe loss of vibration sense in these localities would, therefore, be significant. But the differences between the normal and pernicious

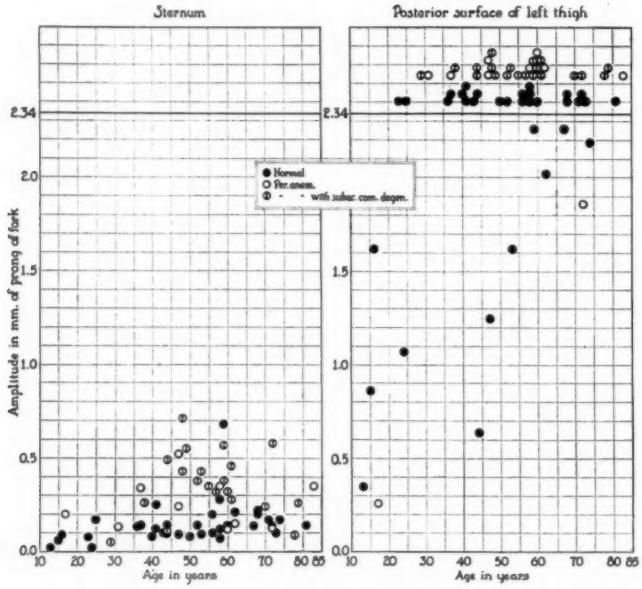

Fig. 14. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

less than the average normal, as was true over the other vertebræ tested. Again, there were no patients having edema over this vertebra.

In general, the threshold values over the *sacrum* (Fig. 16) are high in both normal and pernicious anemia patients. Thirteen of the thirty-four normal patients and twenty-four of the pernicious anemia patients had thresholds greater than the working range of the apparatus. Of those twenty-four, eighteen had subacute combined degeneration, while of the six, whose thresholds were below 2.34 millimeters, only two had subacute combined degeneration. None of the patients tested had either paresthesia or edema over the sacrum. Sacral fat pads may be a factor in causing a reduction in vibratory acuity over the sacrum. These findings are not in accord with the statements of practically every writer who has attempted quantitative measures of vibration sense, that decrease in vibratory acuity over the sacrum is a diagnostic sign in tabes dorsalis.

anemia patients were not sufficiently great to be a determining point in clinical diagnosis. While, in general, pernicious anemia patients with subacute combined degeneration had somewhat less vibratory acuity than those without demonstrable disease in their spinal cord, yet the number of such patients was too small to permit any general deduction. Over the anterior superior iliac spine, in the majority of cases, the thresholds were very irregular; there was a tremendous spread in the normal thresholds. This point, therefore, appeared to have no value in clinical examination in pernicious anemia. Values obtained over the posterior aspect of the thigh were all very high. This point cannot be tested well with the type of fork used in the usual clinical work.

Over the seventh cervical spinous process and the anterior superior iliac spine there was a tendency to threshold increase with age. This finding was vitiated by certain thresholds in the later periods of life which were no greater than

those found in earlier years. In general, the findings were so irregular and the spread so big over the seventh cervical and sixth thoracic spinous processes that testing over these areas for the determination of subacute combined degeneration appears to be without value in the usual clinical examination. Over the twelfth thoracic vertebra, the average normal threshold was lower than that over the other two vertebræ tested. Further, no normal individual had a threshold above 2.34 millimeters. Though this vertebra appears to be a better point to test than the seventh cervical or sixth thoracic, yet it, too, had rather irregular findings and is not well adapted as a point for precise clinical testing. The thresholds obtained over the sacrum were all high. This increase in the thresholds may be due, in some instances, to the presence of sacral fat pads. From this study, sacral dip does not appear to be peculiarly characteristic of tabes. There is a considerable difference between the normal and pernicious anemia patients' thresholds over the tibia and fibula. These two points are relatively free from scatterings in their threshold values. Particularly over the tibia, there is a progressive age increase in the thresholds. These two sites are the most reliable for determining vibration sense disturbances in pernicious anemia.

Figure 17 indicates that the eighteen points tested in the normals tend to arrange themselves into three groups according to the vibratory acuity over the points. Thresholds over the upper extremity are lower than those over the lower extremity, and those over the lower extremity are lower than those over the back. The average normal threshold over all points tested was less than in pernicious anemia patients. The mean deviation was so great in all cases except the sternum that the difference between the normal and pernicious anemia patients' thresholds loses its value in precise examination of vibratory sensation.

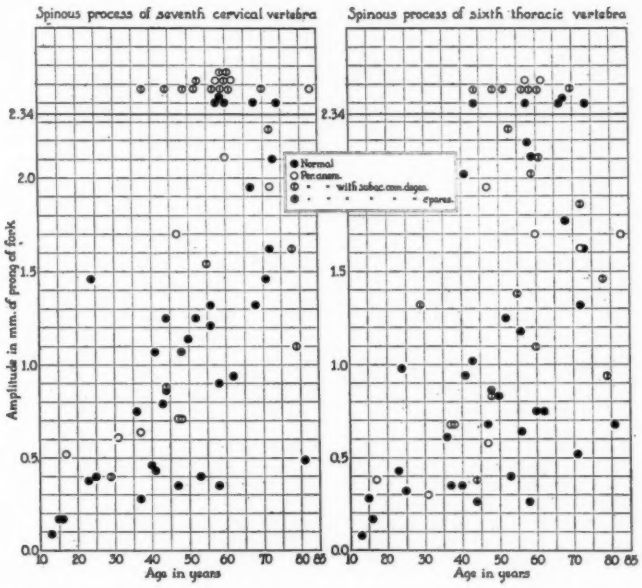

Fig. 15. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

Intensive study of a single normal individual. —The vibration sense threshold of a hospital intern (Table I, Case 5) was repeatedly determined over a period of ten days on the medial surface of each tibia at a point eight inches above the lower margin of the internal malleolus. The data in this case are given in Table IV, second and third columns. In addition to testing with the base of the fork (one centimeter in diameter) as was done throughout the other parts of this study, tests were made while interposing circular metal plates, two centimeters and four centimeters in diameter respectively, between the base of the fork and the area being tested. These data

are collected in Table IV, columns four to seven, inclusive.

It is apparent from the table that, following the first experience or two with the test, this individual improved so that his threshold values subsequently were lower and reasonably uniform.

threshold values, as this occurred too abruptly and the subsequent values were too regular.

Referring to the values for the interposition of the metal disks, it is seen that the average threshold was highest for the largest disk. One might argue from this that with the larger disk less

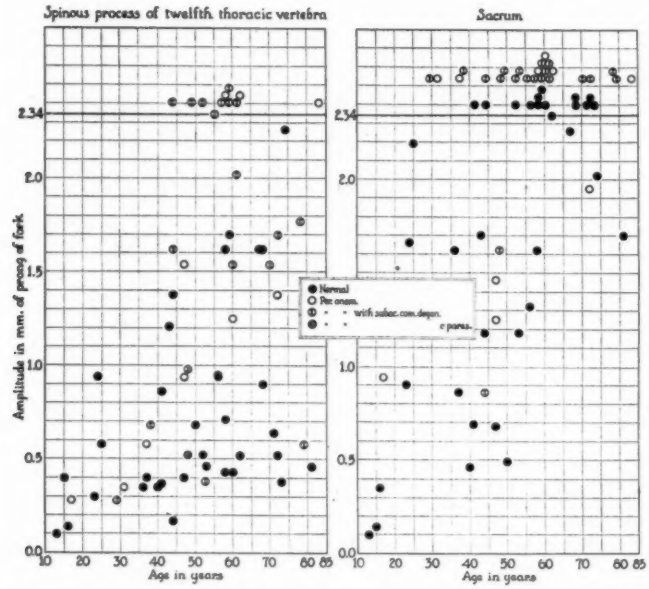

Fig. 16. Individual threshold values plotted according to amplitude of vibration of fork and age of patient.

The specific factors at play in determining this fact are not apparent from any observations that were made. It scarcely seems likely that simple fluctuation in attention or improvement with more practice is responsible for the drop of

of the weight of the fork was transmitted to the underlying bone because of the larger area of padding by the overlying soft parts, but the differences of the averages are so small as to be unconvincing.

TABLE IV. THRESHOLDS IN NORMAL INDIVIDUAL IN TERMS OF MILLIMETERS OF AMPLITUDE OF PRONG OF TUNING FORK; VARIATIONS DURING A TEN DAY PERIOD

Diameter of base	1 cm.		2 cm.		4 cm.	
Date	Right	Left	Right	Left	Right	Left
12/ 6/29	0.220	0.229				
1/24/30	0.403	0.112	0.376	0.101	0.546	0.363
1/25/30	0.144	0.021	0.173	0.031	0.300	0.076
1/26/30	0.027	0.015	0.031	0.031	0.039	0.039
1/27/30	0.120	0.041	0.130	0.051	0.123	0.061
1/28/30	0.021	0.018	0.031	0.021	0.031	0.021
1/30/30	0.071	0.056	0.071	0.076	0.071	0.144
1/31/30	0.020	0.076	0.021	0.088	0.031	0.104
2/ 2/30	0.088	0.101	0.063	0.112	0.082	0.173
2/ 4/30	0.018	0.015	0.018	0.018	0.031	0.027
Average	0.113	0.068	0.102	0.059	0.139	0.112
Mean deviation	0.087	0.049	0.083	0.038	0.126	0.076

The main point of interest shown by this experiment is the close correspondence of the threshold values with one another on subsequent days of testing for a given point.

COMMENT

Previous methods used to test vibratory sensibility quantitatively were inadequate. In general, all the methods employed are subject to similar criticisms. First, testing has previously been done by placing the fork, vibrating at an easily appreciable amplitude, on the patient's body and then having the patient indicate when the vibrations are no longer perceived. This is physiologically inaccurate and contrary to generally accepted rules for the precise testing of sensation. If the threshold is determined in this fashion, the patient may become adapted to the sensation and thus will probably perceive it beyond the time when the stimulus is actually effective. The correct method is to approach the threshold of sensation from a subliminal value. The vibration, furthermore, must be maintained at a constant amplitude. Second, many of the forks which have been used were not standardized and a recheck of the values obtained is, therefore, impossible. Finally, none of the quantitative estimations which have been made have been in units which might be examined from a mathematical standpoint and, therefore, the results are all incapable of statistical treatment.

The present apparatus possesses certain distinct advantages. The threshold of vibratory sensation is approached from a subliminal value. The apparatus is standardized and may be duplicated. It is one that may be used any place where 110 volt, sixty cycle current is available. The apparatus is light in weight compared to one which would require another fork or battery to drive it. The weight of the fork, 500 grams, is constant. The results obtained by this method of testing may be expressed in mathematical terms and thus the result treated statistically.

This apparatus and method of testing are subject to certain disadvantages and difficulties. Overtones appear in the fork immediately upon the stepping up of the current to any marked degree. These overtones persist for a period of about twenty seconds, and, therefore, whenever the current is increased, one must wait that twenty seconds before reapplying the fork to the point being tested. The working range of the apparatus is limited, in that its greatest constant amplitude of vibration is 2.34 millimeters at the tip of the prong. This disadvantage could be remedied and the apparatus thus improved in two ways. One might use a fork of sixty double vibrations per second and thereby be able to make

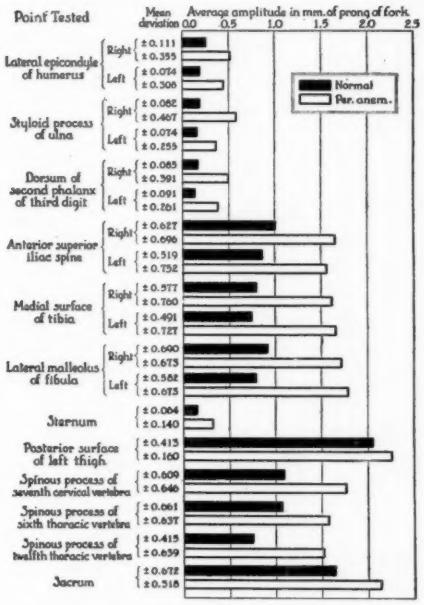

Fig. 17. Average threshold values for all cases on respective points tested.

the energizing coil between the prongs of the fork of greater size and, consequently, capable of producing greater magnetic force and wider amplitude of vibration of the prongs. Also, the iron core within that coil might be increased in size and so reduce or limit the saturation. There are certain physiological difficulties encountered in testing this sensation, prominent among which is that of paresthesia. Frequently patients suffering from paresthesia have decreased vibratory acuity in the area involved. There are certain other disadvantages which likewise apply to any other form of sensory testing, namely, the presence of fat, edema, temperature disturbances, and attention, intelligence and coöperation of the patient.

If, as many physiologists maintain, the skin is the seat of vibratory reception, the sensation should not be so severely reduced as it was over the posterior thigh. The bone appears to have a definite rôle in vibratory reception.

Except in the work of Pearson,[22] the vibratory changes with advancing age have either not been noted or not seriously considered. This decrease in vibratory acuity becomes particularly prominent at about the age of forty. Acquired disease processes in the central nervous system likewise are commonly effective at approximately the same period in life. Age changes must be given consideration in determining the vibration sense threshold, especially in patients with subacute combined degeneration or tabes dorsalis.

While the pathologic cases were studied primarily because they were definitely diagnosed as pernicious anemia and irrespective of their neurologic findings, of the thirty cases of pernicious anemia, twenty had signs of cord involvement. The percentage of central nervous system involvement, therefore, conforms even in this small number of cases with that observed by Woltman,[25] and by Hamilton and Nixon.[26]

SUMMARY AND CONCLUSIONS

1. A new method is described for the determination of vibration sense thresholds with a precision which hitherto has not been attained.

2. Thirty-four normal individuals have been studied by this method with results as follows:

(a) The threshold value at any given point tested in a normal individual tends to be fairly constant at least within a time interval of days.

(b) Different test points in the same individual have different threshold values.

(c) From individual to individual, comparing homologous testing points, one finds a marked variability of the thresholds. This variability increases with age; some older persons have low values, but the tendency is towards decreased acuity, even loss of vibration sense, with increasing age over nearly all points tested. The sternum is a partial exception to this statement.

(d) The threshold values for a fleshy point on the body (posterior thigh) are relatively very high, showing that vibration sense is best perceived through the medium of bone. This does not necessarily mean that vibration sense is strictly an osseous sensation.

3. Thirty pernicious anemia patients were likewise studied, permitting certain conclusions.

(a) Paresthesias cause confusion of interpretation in determining vibration sense threshold values.

(b) As far as the present material constitutes evidence, edema is only a slightly disturbing factor in the determination of threshold values.

(c) At all points tested, the pernicious anemia threshold values were higher on the average than was the case in the normal individuals. On the other hand, the variability in both the normal and pernicious anemia cases was so great and the values for the two groups were so intermingled, that the diagnostic value of the test appears to be much less than one would conclude from reading the literature on pernicious anemia.

(d) Vibration sense determinations in individuals under forty years of age are probably fairly reliable.

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PRESENT STATUS OF SCARLET FEVER PREVENTION AND SERUM TREATMENT*

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OF all infectious diseases there probably is none whose attempted prevention and serum treatment has caused more widespread interest, none which has occasioned so much "curbstone controversy" and yet about which there is such unanimity of opinion in the reports of experienced observers, as scarlet fever.

Prior to the standardization of preparations and methods of immunization and treatment by

*From the Department of Pediatrics, University of Minnesota, and the Contagious Division, Minneapolis General Hospital. Read at the annual meeting of the Minnesota State Medical Association, St. Paul, May 24, 1932.

TABLE I

Investigator	Number Dick positive	Number injected	Prep.	Doses	Amount	Carried to neg. react.	Reactions (General)	Chance of inf.	Number cases scar	Control cases		Time observed	
										Obser.	Infect.	Inoc.	Control
Dick,[1] 1924-1931	11,584	11,584*	Dick	5	500-100,000	Yes	10%	Intern and nurse	None	?	37 N. & I. not inoc.	4½ yrs.	4½ yrs.
Rhoads,[3] 1931	380	298*	Dick	5	500-80,000	Yes	.24 hos. days lost per nurse	Nurses	None	82 N. ? I.	15 (N. & I.)	3½ yrs.	3½ yrs.
Rhoads,[3] 1931	989	492*	Dick	5	500-80,000	444		Epid.	None	206	11	10 mos.	2 mos.
Knights,[4] 1928-29	53	26*	Dick	5	500-80,000	No		Nurses	None	248	12	1 yr.	1 yr.
Kiefer,[5] 1926-28	799	799*	Dick	4	500-30,000	Yes		Intern	1	Several Inst.	10	3 yrs.	2 yrs.
W. Benson and G. Simpson,[6] 1927	42	42	London & Ed. Univ.	3	200-2,000	37	30% mod.	Nurses	None	145	8	18 mos.	18 mos.
T. Dudley,[7] quoted by J. Townsend, '27	17	17*	Dick	5	500-20,000	No	20%	Epid.	None	23	2	2 mos.	2 mos.
W. H. Park and M. Schroeder,[8] 1928	195	195*	Park N. Y. B. H.	5	26,000 to 46,000		Mod.		None			18 mos.	
A. Lichtenstein,[9] 1930-31	82	82	Comb. pass. & Act.	5	Toxin 300-1,500. bact. ½ to 5 bil.			Epid.	1 (in 5 mo.)	None			
L. D. Hektoen	121	121*				Yes		Nurses Durand	None	517	40	4 yrs.	10 yrs.
Brokman,[11] 1931	16,345	16,345	Toxin	2-3	3,500 S.T.D.	No		School, no exp.	.37% 60 ca.	89,818	1.26%	18 mos.	18 mos.
Brokman,[12] 1931	7,887	7,887	Toxin	2-3	3,500 S.T.D.	No		School, no exp.	.4% 30 ca.	63,920	1.09%		
Platou and Collins[13]	54	54	Zingh.	3	250-500 1,000		12%	Nurses and chil.	None			12-15 mos.	
Platou and Collins[14]	100	100	Larson	2-4	3,000	No			8			12-15 mos.	
Harrington,[15] 1931		9,158	Larson	3 do. to 6,953 cases 1 to 2,205	3,000	No	15%		64	Esti. non-inoc. child pop.	4,579	5 yrs.	5 yrs.
W. B. Park[16]		5,000*	N. Y.	4-5		No		Institutional ch. sev. expo.	None			4-5 yrs.	

the Scarlet Fever Committee, many unfavorable impressions, no doubt, were gained by practitioners regarding the efficacy of scarlet fever toxin and antitoxin. There is reason to believe that these concepts may have resulted from the use of poor preparations, inadequate dosage, improper precautions and fear of serious reactions. The dogmatic "nay" of cursory observers did much to enhance this controversial tendency.

Sufficient time has now intervened, I believe, to permit the accumulation of data sufficient to justify a critical study which may shed some light on these questions.

PREVENTION

The medical literature since 1924 furnishes us with observations on more than fifty thousand persons who have been studied for variable periods of time following inoculation with scarlet fever toxin.

My experience, first with Zingher's preparation, in 1924, then with Larson's ricinoleated toxin, and later with larger graduated doses of Dick's toxin, has afforded me an opportunity to observe 500 inoculated children, 861 inoculated and uninoculated nurses and attendants in the Contagious Division of the Minneapolis General Hospital and 1,200 patients with scarlet fever in whom histories were investigated with respect to previous inoculation. A personal communication from Dr. W. H. Park of New York adds 5,000 institutionalized children to the list of inoculated cases. In addition, Dr. Harrington of the Minneapolis Health Department has kindly given me records on 9,158 children who have been followed since their injections five years ago.

The compilation in Table I includes the cases reported to date in which sufficient details were available to warrant analysis.

Inspection of the table shows that among 18,453 susceptibles (see asterisks in Table I) who were inoculated with approximately the technic recommended by the Scarlet Fever Committee and observed over periods of from two months to five years, only one person contracted the disease, a fact which is particularly convincing with respect to protection conferred since almost every one of these individuals was either an attendant in scarlet fever wards or was present in an institutional or community epidemic.

Further study of the data shows that among 33,636 persons (see references 9, 11, 12, 15 and Table I) who were inoculated with doses and preparations not in accordance with the recommendations of the Scarlet Fever Committee, there were 163 who contracted scarlet fever during periods ranging from five weeks to five years. Moreover there was less chance of infection among these, since most of them were school children (Brokman,[11,12] Harrington[14]) who were studied at a time when no epidemic was in progress. It is noteworthy, however, in the latter group, that in spite of the inadequate methods of immunization used the incidence of scarlet fever was only one-third to one-seventh of that prevailing among the non-inoculated (based on estimated child population for controls[14]).

Table II shows the case incidence of scarlet fever in five hundred inoculated children observed during the past five years. These were checked by personal communication and by matching with the Minneapolis Health Department records.

TABLE II

Number injected	Preparation	Amount	Doses	Scarlet Fever
366	Larson's	3,000 S.T. doses	3	6 cases
64	Zingher's	250 to 2,000 S.T. doses	3-4	1 case
70	Dick's	500 to 75,000 S.T.D.	5	0 cases

Although the number of observations in Table II is too limited to draw any definite conclusions it would seem that those receiving Dick's graduated (larger) doses were perhaps afforded a somewhat greater protection.

The most exacting test of active immunization is, of course, that offered by individuals who attend scarlet fever patients. During the past six years there have been 861 persons in attendance at the Minneapolis General Hospital contagious department. Through the courtesy of Dr. Ruth Boynton, who has charge of inoculation of all Central School nurses, and with the kind help of Dr. Tuohy, Dr. Borman, Dr. Sax and Dr. Sonnesyn, who collected the scarlet fever records, I have been able to gather data concerning the incidence of the disease among these attendants (Table III).

TABLE III

861 Attendants in Contagious Department of Minneapolis General Hospital during the past six years (to May 1, 1932)

			Total number	Time observed	Contracted scarlet fever	Per cent
Group I	Known to have had no toxin.	Staff, Internes, Supervisors, Maids, Orderlies, Laboratory Workers	181	6 years	9	5.0
Group II	Some received 3 doses (9,000 S.T.D.) Larson's or 10,500 S.T.D. Dick's. Many received no toxin.	Student Nurses	601	6 years	46	7.0
Group III	Received 5 doses (110,500 S.T.D.) Dick's toxin.	Student Nurses	79	2 years	0	0

The usual case expectancy of scarlet fever among nurses in institutional experience reported elsewhere is approximately seven per cent.[1,2,10] This is confirmed by the findings in Groups I and II (Table III).

Of the forty-six student nurses who contracted scarlet fever (Table III), eight had received three doses each of Larson's toxin (9,000 S.T. D.), four had received three doses (10,500 S.T. D.) of Dick's toxin but the remaining thirty-four had not been immunized. The majority of our cases of scarlet fever among nurses, therefore, were in the non-immunized. No student nurse who has received five complete doses of Dick toxin (110,500 skin-test doses) has as yet become infected although it must be admitted that this group comprises only seventy-nine individuals and about one-half of these have not yet had the same duration of exposure as existed in Group II. All Central School student nurses are now receiving the dosage recommended by the Scarlet Fever Committee.

Among 1,200 scarlet fever patients admitted to the Minneapolis General Hospital during the past six years, sixty-one had been inoculated. Five of these had received small doses of Dick toxin whereas fifty-six had received 3,000 to 9,000 skin-test doses of ricinoleated toxin from five weeks to five years previously.

DISCUSSION

I have attempted in this study of 52,200 inoculated persons taken from the literature and from personal experience, to bring out some of the facts regarding the value of active immunization against scarlet fever based upon subsequent case incidence.

Analysis of the reported case studies to date shows clearly that small doses of toxin as first administered for the prevention of this disease were inadequate, a fact which is attested to by the occurrence of many cases of scarlet fever following their use. It would seem further that ricinoleated toxin as well as other modifications of the toxin, have not proved satisfactory in conferring immunity to scarlet fever.

The reports so far indicate that large doses of pure toxin have been effective in preventing scarlet fever. To control institutional and community epidemics, inoculations of toxin are given only to (susceptible) exposed persons whose throat cultures (on blood agar) are negative, whereas positive culture cases (those already infected or carriers) are isolated and given antitoxin if symptoms develop. In the absence of symptoms at the end of a week these passively immunized cases are then inoculated with toxin. A number of institutional epidemics apparently have been controlled promptly by this procedure.

To date scarlet fever has not been reported as occurring within four years following the administration of the dose recomemnded by the Scarlet Fever Committee.*

General reactions were noted in 10 to 20 per cent of persons after each dose of toxin, and

*I. E.—500, 2,000, 8,000, 25,000, 75,000 skin test doses at intervals of one week followed two weeks later by a Dick test and an additional 100,000 S.T.D. if this is found positive.

although a few instances of a twenty-four to thirty-six hour period of rather severe toxemia were encountered, not one serious reaction could be found in over 200,000 injections of toxin even in instances where overdosage was given by mistake.

SERUM TREATMENT

Scarlet fever streptococcic antitoxin was used rather extensively at the beginning of the century, following its introduction on the continent by Marmorek[15] and Moser.[16] It fell rather quickly into disuse and remained in obscurity until interest was revived in 1924 by the announcement of the Dicks[17] and Dochez[18] of an antiserum produced by horse immunization with the toxin of streptococcus scarlatinæ. Experiences with this form of specific therapy have since been reported by a number of observers, many in the nature of clinical impressions, a few with more elaboration as to materials, dosage, time of administration, case selection, criteria of effectiveness and controls.

In a report on 100 serum-treated cases of scarlet fever observed in 1925 I prepared a chart for the tabulation of critical data including the above mentioned factors which might help in arriving at reasonably accurate conclusions with regard to the merits of antitoxin.

A general summary of the results of serum therapy in 2,430 reported cases suggests an earlier temperature recession in the treated than in the control cases by about two days; yet an especially careful study of mean temperatures in 110 of these cases by Veldee et al[29] failed to show any superiority for the serum on the basis of febrile reduction alone. All observers agreed, however, that the duration of the eruption was less among early treated cases than was true in the untreated (an average decrease of 2.4 days). Symptom improvement in the serum-treated cases was remarked upon favorably by all, but obviously a numerical comparison with the controls could not be accurate (where noted, there was an apparent acceleration of about two days). Studies made on desquamation showed invariably that this was localized and very mild in serum-treated as compared with control cases. The influence of early administered antitoxin on the incidence of major complications was rather striking. The studies reporting these are included with averages for otitis, adenitis and nephritis in Table IV.

TABLE IV

	Otitis	Adenitis	Nephritis
1664 serum-treated cases	5.9%	3.9%	0.8%
2093 untreated controls	12.7%	11.7%	3.8%

Where arthritis and other complications were listed they were noted less frequently in the serum-treated cases than among the controls, but whether or not serum was a responsible factor could not be determined with accuracy.

Serum reactions occurred in an average of 44.9 per cent of 2,350 cases receiving antitoxin although these were admittedly negligible except in 10 per cent of the cases. In this 10 per cent group a few reactions were reported as being more severe than the disease itself. Two deaths, which it seems may be attributed to anaphylaxis, were reported, one by Banks[26] and another by Stewart[32]; the first following intravenous and the latter after intramuscular injection of the antitoxin.

At the Minneapolis General Hospital to date we have given antitoxin to approximately three hundred cases of scarlet fever, in which an early diagnosis and evidence of moderately severe toxemia warranted its use. By exercising the most extreme caution in testing for serum sensitivity we have been able to prevent serious reactions so far and our results compare favorably with those previously reported.

On the assumption that scarlet fever toxin is disseminated to a maximum rather early in the course of the disease the best method of serum administration should theoretically be the intravenous. Although this seems to be borne out by the reports of over 500 cases[25,26] so treated to date, nevertheless, it must be emphasized that serious and even fatal serum reactions can and do occur. The most rigid precautions are necessary to prevent this. A careful history, tests with diluted serum into or under the skin, and slow careful administration guided by a tourniquet and stopped if symptoms of anaphylaxis appear are exceedingly important. When these precautions are exercised, the administration of antitoxin may be beneficial if given to severely toxic patients early in the course of the disease.

COMMENT

A valid criticism of the data so far available on scarlet fever prevention and treatment is the lack of detail in the majority of individual case studies and which if given might eliminate the factor of error through chance.

Realizing this I have attempted to draw conclusions on the basis of the prevailing opinion of the most experienced observers.

CONCLUSIONS

1. A somewhat controversial tendency in regard to the value of prevention and serum treatment of scarlet fever may have resulted from improper preparations, dosage, methods and precautions previously employed.

2. A study of the reports on 52,200 persons inoculated for the prevention of scarlet fever seems to indicate that:

(a) Small doses of toxin as first administered were entirely inadequate, a fact attested to by the occurrence of many cases of scarlet fever following their use.

(b) Ricinoleated and modified forms of toxin have not as yet proved satisfactory in conferring immunity against the disease.

(c) Large doses of pure toxin as recommended by the Scarlet Fever Committee have been effective in the control of institutional and epidemic scarlet fever for as long as four years after their administration.

(d) General reactions which are sometimes distressing but never serious occur in ten to twenty per cent of persons receiving pure scarlet fever toxin.

(e) Graduated doses of pure scarlet fever toxin to the point of a negative Dick test (as outlined by the Scarlet Fever Committee) are warranted from the evidence so far available but should be given with the full knowledge that distressing but not serious reactions do occur.

3. A summary of the results in 2,430 reported cases of early uncomplicated scarlet fever in which specific streptococcus antitoxin was used shows that:

(a) Temperature recession is usually more prompt in the serum-treated cases than in control cases.

(b) The duration of the eruption is shorter in the treated than in the untreated cases.

(c) Early symptom improvement is more common in the serum-treated casees.

(d) Desquamation is milder and more localized in those who receive serum than in those who do not.

(e) Antitoxin exerts a favorable influence on the incidence of major complications.

(f) Intravenous administration of serum probably gives the most striking therapeutic results.

(g) Serum reactions are a menacing factor in about ten per cent of cases and can be the cause of death unless the most rigid precautions are employed.

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THE DIAGNOSIS AND TREATMENT OF INFECTIONS OF THE URINARY TRACT IN CHILDHOOD*

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THE diagnosis of infections of the urinary tract in childhood is usually made by examination of the urine, because in this period it is unusual for the patients to have symptoms or signs referable to the urinary tract. This absence of local symptoms has led the pediatrician to make a provisional diagnosis of pyelitis whenever he sees an acutely sick patient with high fever and absence of local symptoms. In infancy, a chill is more likely to be a symptom of onset in urinary infections than in pneumonia. The finding of pus in the urine when its vaginal or preputial origin can be excluded warrants a diagnosis of urinary infection. To avoid error in diagnosis it is advisable to obtain a catheterized specimen from all girls and from boy infants; it can be obtained from older boys after they have passed a small amount of urine with the foreskin retracted, and by catching some of the remainder in a sterile container.

I have advisedly said to rely on a catheterized specimen of urine instead of a culture of the urine because I think that the difficulty of making cultures practically excludes this procedure in general practice, but it is possible to carry a small metal catheter for the girl and a small rubber catheter for the boy and a few small glass tubes which can be boiled just before using. If lysol is not available the urethral outlet can be swabbed with sterile water and then mopped dry with absorbent cotton. A small specimen can be carried to the office and examined within four to six hours under the high power microscope. In case of infection, innumerable organisms will be seen in the field and numerous pus cells. The former may be present without the latter and are of equal significance in making a diagnosis. The members of the colon-typhoid group are most commonly the causative organisms, and this type of infection is about three times as common among girls as among boys. Tuberculosis of the kidney occurs just frequently enough so that the presence of marked pyuria with negative cultures on the ordinary culture mediums should make one suspect it. In our experience hematuria complicating sterile pyuria makes it practically certain that one is dealing with renal tuberculosis. The bacilli of tuberculosis are usually found in large numbers in the urinary sediment.

Having made a diagnosis of urinary infection, it is essential to know the organism and the state of the urinary tract. The kidneys may be involved in the infection with resultant loss of function. If any back pressure is present, it is more difficult to effect a cure.

It is necessary to make a complete examination in all cases in which recovery is not rapid under treatment. Such examination includes chemical, microscopic and bacteriologic examination of the urine. Roentgenograms of the bladder, ureters, and kidneys, estimations of the blood urea, residual urine, return of phenol red, a cystogram and, if indicated, an intravenous cystogram. If nothing is found, a period of two to three weeks intensive treatment should be tried before a cystoscopic examination, ureteral catheterization and pyelogram are made. By such complete urologic examination the presence of any abnormality of the urinary passages, which may be present in the various forms as indicated in Figure 1, is determined. Symptomatic cure and disappearance of pus from the urine is usually not difficult but sterile urine on culture after discontinuation of the treatment is the only evidence acceptable that the treatment has been successful. It is apparent that diagnosis as well as cure should be controlled by culture.

The treatment of acute pyuria in infancy and childhood consists first of an attempt to wash out the upper urinary passages as much as possible. Alkalinization of the urine has been practiced widely in addition to the administration of fluids by mouth, rectum, peritoneum, muscles, or veins. Whether alkalinization is of any value has never been definitely proved, its effect on the growth of the infecting organism is nil; a soothing effect on the inflamed mucous membrane has been assumed, but has never been proved. Clark

*From the Section on Pediatrics, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, St. Paul, Minnesota, May 24, 1932.

has recently shown that patients with cystitis manifesting pain, irritability, frequency and tenesmus, are benefited by increased acidification of the urine to a pH of 5.2 and 4.8. We know that the colon bacillus grows with almost maximal intensity at the highest hydrogen-ion concentration that can be attained by alkalinization. The effect of acid reaction on the colon bacillus is very much more evident at a hydrogen-ion concentration that can be readily attained by medication. A pH of 5 can be reached in the urine with moderate doses of ammonium chloride, and although only exceptionally has an organism been found that is inhibited in its growth at this hydrogen-ion concentration, the growth is slowed considerably and cures have been reported with a urinary hydrogen-ion concentration that has not reached lower levels. The combination of large amounts of fluid and acidity of urine sufficient to inhibit bacterial growth makes an ideal combination during the acute stage to wash out the passage and prevent further growth of organisms in the urinary passages.

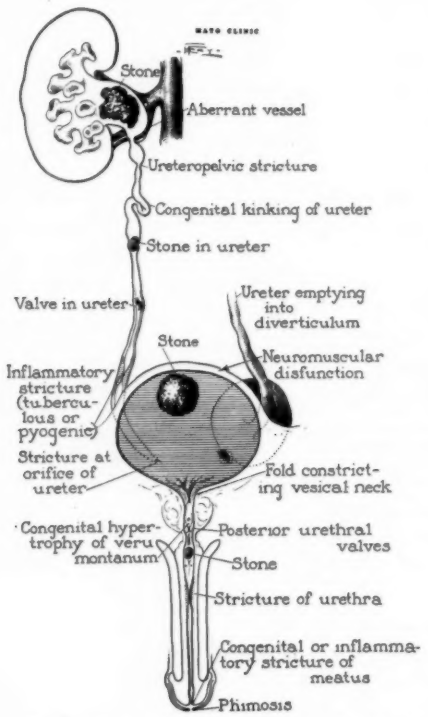

Fig. 1. Various conditions that may give rise to urinary obstruction.

In the more chronic cases observed, experience indicates that methenamine used under controlled conditions offers better chances of success than any of the other urinary antiseptics. Gillespie recently studied the bactericidal effect of pyridium and serenium, two newly introduced urinary antiseptics, and has not been able to show that they are of any value in the treatment of colon infections. Work on the use of methenamine has shown in vitro experiments that the degree of acidity is of the utmost significance in successful treatment. Without an accurate control of urinary acidity, methenamine may be of no more use than so much water. At a pH of 6 with 0.5 per cent concentration of methenamine, not enough antiseptic power developed in urine to kill the colon bacillus after twenty-four hours, but at a pH of 5, one-tenth of this dose killed all organisms within that time period, and the same dose rendered the urine sterile in six hours. By means of methyl red paper which turns bright red at a pH of 5.5 and below, it is possible to determine whether the acidity of the urine is sufficient to split methenamine rapidly enough to produce bacteriostasis or even bacteriolysis in six to eight hours. Whether this suffices to clear up the infection, only trial will tell. If unsuccessful, it is probable that urinary stasis is present in the system, and the cause of the stasis should be determined, if possible, by complete urologic examination.

In treatment with methenamine the urine is rendered sufficiently acid to turn methyl red paper by the use of increasing doses of ammonium chloride (enteric coated tablets), starting with from 5 to 15 grains four times a day depending on the age of the child. Then methenamine is given in initial doses from 2 to 5 grains four times a day every six hours. After three days the urine is cultured and if after twenty-four hours the plate is sterile, the drug is continued three days longer and the urine is again cultured. If it is again sterile the drug is discontinued and after three days the urine is again cultured. If sterile, the culture is again taken in three days and if again sterile it is evident that the infection has been overcome. If with the first dosage the urine is not sterile, the methenamine is increased 2 to 5 grains for a period of three days and cultures made and the treatment with increased dosage repeated as mentioned. If the urine does not became sterile the dose is increased again

by the same amount until either the cultures become sterile or irritation of bladder and hematuria sets in and treatment has to be discontinued temporarily. A patient should not be dismissed as cured until two negative cultures have been obtained after medication is discontinued.

In the last ten months we have been using the ketogenic diet at The Mayo Clinic for the treatment of urinary infections of children with excellent results. In a study of such urine, it was found that most specimens of ketonurine* with a pH below 5.6 had definite bactericidal power. Exceptionally urine in the pH range from 5.2 to 5.6 did not have this power and that above 5.7, in spite of a strong diacetic acid test, has no antiseptic effect. Further study showed that the bactericidal effect was not due to the low pH as such, to the presence of diacetic acid or sodium diacetate. The bactericidal action of the ketonurine is probably due to acidity below pH 5.5 in synergy with substances in the urine hitherto not determined. It is hoped that in the future it will be possible to simplify the diet so as to make it more generally applicable. At present it is almost essential to have a dietitian available for the working out of the diet. The patient is given about 50 calories for each kilogram of body weight and 1 gm. of protein for each kilogram. For a child weighing 30 kg., the diet starts with 30 gm. (120 calories) of protein, 70 gm. (280 calories) of carbohydrate, and the remainder up to 1,500 calories in fat (120). The second day the carbohydrate is reduced to 50 gm. and the fat is correspondingly increased; the third day only 30 gm. carbohydrate is given, with a further increase in fat to match the calories; the fourth day only 20 gm.; the fifth 15 gm., and the sixth 10 gm. are given. This is usually sufficient to insure ketosis as indicated by a strongly positive diacetic acid test, and in most instances a pH well below 5.5. If the hydrogen-ion concentration does not fall below 5.6 or again rises above 5.5, the addition of 1 to 3 gm. of ammonium chloride a day will reduce the hydrogen-ion concentration to the desired range. This should result in sterilization of the urine in from five to ten days.

By means of the diet the condition in eight of nine cases of urinary infection was cleared. In three of the cases major urinary anomalies were associated with retention. Table 1 contains the details of the six cases in which urinary anomalies were not present. The single failure was in the case of a boy with hypospadia and infection due to Proteus vulgaris. Here as long as the pH was 5.6 there was marked reduction of the number of organisms in the urine to 400 and 100 for each 0.5 c.c. of urine. When the pH rose to 6.1

*Condition of the urine after the administration of a ketogenic diet.

TABLE 1. PATIENTS WITHOUT ANOMALIES TREATED WITH KETOGENIC DIET

Age, years	Type of organism	Pus in urine, grade	Days on diet	Interval between first ketosis and and sterilization of urine, days	Days after stopping diet urine culture sterile	Relapse	Comment
10	Colon bacillus	3	10	6	4	+	Streptococcus lactis cultured during relapse
12	Colon bacillus	4	23	6	5	0	
9	Colon bacillus	4	33	?	20	0	
10	Colon bacillus	4	12	8	23	0	
13	Staphylococci	4	22	6	14	0	
8	Proteus vulgaris	4	14			0	Third day of ketosis pH 5.6, 400 organisms per 0.5 c.c. Fifth day of ketosis pH 5.6, 100 organisms per 0.5 c.c. Eighth day of ketosis pH 6.1, innumerable organisms per 0.5 c.c.

TABLE 2. DIET IN CASE 3.

	Date	Grams			Diacetic acid	Urine pH	Bacteria in 0.5 c.c. of urine	Pus, graded
		Carbohydrate	Protein	Fat				
Hydronephrosis (girl, aged seven years)	12-12-31	65	26	100	None		Innumerable	4
	12-16-31	15	26	140	+	5.0	Innumerable	2
	12-17-31	15	26	140	++	5.3	100	2
	12-18-31	15	26	140	+++	5.3	200	1
	12-21-31	15	26	155	+++	5.3	None	Occasional
	12-24-31	20	30	170	+++	5.2	None	Occasional
	12-26-31	45	30	150	None	5.5	None	
	12-28-31	85	35	100	None	8.4	None	Occasional
	12-30-31	85	35	100	None	8.0	None	

the organisms again became innumerable in 0.5 c.c. At the time this patient was treated, the significance of a low hydrogen-ion concentration was not fully appreciated. Two patients became reinfected, but both with a different organism. Short abstracts of the three cases of urinary anomalies follow:

Case 1.—A child, aged eight years, had had chronic infection of the urinary tract for an unknown period. Albuminuria and pus were both graded 1. Innumerable Gram-negative bacilli were found on culture. The concentration of urea was 24 mg. in each 100 c.c. of blood and the phenolsulphonphthalein test gave a return of 55 per cent. The cystogram did not show reflux into ureters. Left renal colic was present. Intravenous urogram revealed dilatation graded 3 of the left pelvis and calices; medium was not shown in any film in ureter below ureteropelvic juncture. Urine was found sterile on culture after five days of the diet.

Case 2.—A child, aged nine years, had had pyelitis three years ago. Cystoscopic ureteral catheterization had been done with improvement. Definite cure had not been obtained. June, 1931, there was recurrence of pain and fever, with pus in the urine graded 4. Examination disclosed albuminuria graded 2, and pyuria graded 4. Cultures of urine from the bladder and ureters showed innumerable hemolytic streptococci. Roentgenologic examination of the kidneys and bladder was negative. The concentration of urea was 22 mg. in each 100 c.c. of blood; the phenolsulphonphthalein test gave a 50 per cent return. Cystoscopic examination showed diffuse cystitis, bilateral pyelonephritis, bilateral hydronephrosis and hydro-ureter with probable duplication of ureter on the left side. The tuberculin test was negative. Culture of urine was sterile five days after the patient was placed on the diet.

Case 3.—A child, aged seven years, had had pyuria with fever to 105° F. and pain in the right side since December, 1930. April, 1931, cystoscopic examination was done. Infected hydronephrosis was diagnosed. July, 1931, the right ureter was dilated. Nephrectomy was considered. A severe attack occurred in October with a massive amount of pus in the urine. November, 1931, hydronephrosis with probable obstruction at the uretero-pelvic juncture was diagnosed. The phenolsulphonphthalein return was 50 per cent in two hours. The concentration of urea was 28 mg. in each 100 c.c. of blood. November 24, 1931, right nephropexy and temporary nephrostomy were performed. The patient was returned to medical service for dismissal December 12, 1931. The urine contained pus graded 4 and innumerable colon bacilli. The patient was placed on the diet, and the infection cleared in ten days (Table 2).

SUMMARY

Acidification of the urine in acute pyelitis should add to the efficacy of large amounts of fluids in washing the urinary tract free from infectious material.

Methenamine in combination with ammonium chloride to acidify the urine to a pH of 5.5 or less has proved superior to any of the other urinary antiseptics I have used.

By the use of the ketogenic diet the urine can usually be rendered bactericidal when the pH is below 5.5. Ketonurine of pH of 5.5 is an excellent antiseptic for clearing up urinary infections and ketonuria should prove useful in the preparation of patients for operation on the urinary tract as well as in their postoperative treatment.

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SIMPLIFIED INFANT FEEDING*

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SCIENTIFIC infant feeding is of comparatively recent origin. The first definite progress was noted in the middle of the last century. It was that period that witnessed the remarkable acceleration in medical research and rapid acquisition of authentic knowledge which so favorably influenced other branches of our profession. The child had already been recognized as an asset. The enormous infant mortality from nutritional disorders demanded attention. Attempts, more or less empirical, to improve existing feeding conditions, produced some favorable results. Advances in this particular branch of pediatrics came spasmodically, alternating with periods of almost complete stagnation, due to the pronounced tendency of physicians to follow some particular school. The dogmatic teachings of an individual whose work seemed to carry an authentic finality would be followed until a new leader appeared. Recently our progress has developed in a more orderly manner. We have acquired some information as to normal growth and development. We have some idea as to how far an infant may deviate from the average and still be normal. The effects of the quantity and quality of food on development and health are being solved through the accumulation of accurate observations. This with advances in physiology, chemistry and allied sciences has contributed materially to our knowledge of infant feeding.

BREAST FEEDING

The simplest method of infant feeding and unquestionably the best is that of maternal nursing. Mothers still want to nurse their babies and the majority can do so either exclusively or in part if properly advised.

The actual contra-indications for maternal nursing are few, the most positive being active tuberculosis in the mother, prolonged infections such as typhoid, nephritis with uremic tendencies and general debility from cancer or other causes. Temporary weaning may be necessary because of operations on the mother and acute infections, but very few nursings need be omitted under such conditions. If pregnancy occurs, gradual weaning of the baby is advisable.

Failures in maternal nursing appearing in the first few weeks are ascribed to numerous causes. Even a casual analysis of these forces one to the opinion that most could have been avoided had there been adequate supervision.

In a recent survey of the charts of infants leaving our Duluth hospitals on artificial food, the specific reason for weaning is not always given. One may infer, however, that conditions formerly regarded as sufficient, such as fissured nipples, mastitis and even retracted nipples are being controlled and rarely constitute adequate cause for weaning. Colic and vomiting have yielded to more recently developed treatments, among which is the use of phenobarbital. Abnormal stools do not appear to excite the apprehension formerly encountered. The most frequent cause of weaning appears to be a failure to gain in weight because of insufficient breast milk. If maternal nursing is to be increased it is evident that more consideration must be given to the development of an adequate supply of breast milk.

The production of breast milk depends largely upon the stimulation of the breasts by the sucking of the baby. The best results are obtained by putting the baby to the breast after the sucking reflex is fully developed. It is unfavorably altered by too early nursing. The reflex does not develop fully under twenty-four hours and may be delayed beyond that period. Hamberger believes that the maximum development is reached on the third day. Definite signs of this development are spontaneous sucking movements, restlessness and crying. The crying is not to be confused with that occurring immediately after birth. If these facts are recognized and a proper routine established, the initial weight loss following birth will be less and the birth weight will be more quickly regained.

The optimum interval between nursing varies with the individual. Usually infants do best on a

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four hour schedule. Some infants do fully as well or better on a three hour schedule.

COMPLEMENTAL FEEDING

Complemental feeding may be necessary. That the necessity really exists should be accurately determined. The efforts of maternity ward supervisors to establish a satisfactory weight curve and the indifference of the physician as to the methods of accomplishing this too frequently determine the addition of a complemental food. Care must be taken that the baby does not get this until all known methods of increasing the mother's milk supply have been exhausted. The addition of artificial food at too early a period will frequently result in an inadequate stimulation of the breasts. The baby must make an effort to get the complemental food and the amount offered should not be sufficient to result in a decreased appetite for the next nursing.

Unfavorable results with an adequate breast milk supply will usually be found by a careful physical examination of the baby. Atelectasis, congenital heart, cerebral hemorrhage, malformation, prematurity, general debility and intercurrent infections are frequent causes of failure to gain. Under all such conditions the baby has a better chance on breast milk than it would have on any other food.

ARTIFICIAL FEEDING

The rapid advances in the sciences contributing to our knowledge of infant feeding were followed by many attempts to make this knowledge not only available but practical. Many systems or methods of infant feeding have been developed. Some of these are comparatively simple. Others, while more complicated and requiring special technic, are equally efficacious. Still others seemingly inspired by commercial interests have less to recommend them.

Before any method of artificial feeding can be used intelligently a knowledge of the fundamentals is necessary. This includes a knowledge of the theory, a familiarity with the various components of milk, the quantities of each desirable, the caloric requirements of the infant and some facts regarding the digestion, absorption and assimilation of food. A familiarity with the symptoms arising from an excess of a component such as sugar or fat is essential. With this background the physician is still without a method of approach to an individual feeding problem until he becomes familiar with one of the many methods available. A thorough familiarity with one method is sufficient. Frequently the physician knows too many methods and believes that it does not matter which one is used. It may not matter what method is followed, provided the physician in addition to his mastery of the fundamentals has acquired the art of infant feeding through experience. He is occasionally lacking in the latter and so changes from one method to another if the infant fails to gain, and not infrequently the results are disastrous.

Attempts to accurately evaluate the different methods of infant feeding that have been followed or are still popular is difficult. Most systerms have been developed to meet certain requirements. Nearly all have made some definite contribution to our knowledge.

The first methods widely used in this country were those of Budin, and Rotch and Holt. The latter, while popular, was particularly dogmatic and complicated for one who was not a mathematician. As we look back now it seems absurd to think that changing a food element a small fraction of one per cent could favorably influence a child's progress. The greatest contribution of these men was their teaching of the necessity of fitting the food to the child.

The complicated system of Rotch and Holt was followed by the German method of simple dilutions of milk with sugar water, sometimes erroneously called the caloric method. Czerny popularized the Holland buttermilk mixture, which was useful where fat intolerance existed. Still later appeared the lactic acid formulas of Marriott and the Czerny-Kleinsmit butter-flour mixture. Both of these are excellent. They have contributed materially to our knowledge of infant feeding and may be used with remarkable results. Simpler methods may be employed.

Foods synthetically prepared to simulate breast milk have some advantages. They may be used satisfactorily over long periods of time. A difficulty which occasionally arises is due to their inflexibility. It is impossible to modify them. The demands of an infant for increased carbohydrate cannot be met without increasing the entire food or by making additions.

Competent observers have given excellent reports on the use of unsweetened evaporated and dried milk preparations. Observations on the

later physical and mental development of infants fed on different types of these foods indicate that the ultimate results with fresh cow's milk are better. In communities where a satisfactory fresh milk is not available, these milks deserve more consideration than other prepared foods.

The unsweetened condensed milk must not be confused with the sweetened variety. The composition of the latter is such that it is impossible to produce a balanced diet by the simple addition of water. When diluted sufficiently to bring the carbohydrates down to the amount which experience has shown to produce the best results, the proportions of the other components are too low. While they may be useful for a short period they should not be used for any length of time.

In addition to these, the market has been flooded during the past few years with a large variety of canned foods. The list includes among others such food as malted milks, milk modifiers and some simply calculated to increase the carbohydrate of the food. Some manufacturers appear to think it is their function to not only give full directions to the mother but also to educate the physician in the science of infant feeding. Conflicting claims lead to confusion and frequently to rapid changes from one widely advertised food to another with disastrous results to the infant. Some of these foods may be used but they are unnecessary. Certainly the multiplicity of canned foods is out of all proportion to their value.

The clinical work of most physicians of wide experience is that the best results can be obtained in the normal infant with diluted cow's milk to which carbohydrate is added.

SIMPLE MILK MIXTURES

In the use of simple milk mixtures it is first necessary to determine the amount of food required. This may be calculated in terms of calories per pound, always using the expected weight for the age. In general, the requirements vary with the weight and age of the infant. A very young poorly nourished baby will require more food per pound than an older well nourished one. If the food requirements are calculated in calories per pound the first baby will need approximately 60 calories per pound while the older well nourished one will require only 40 calories. In all cases the figures are only approximate and may have to be corrected after a few days of observation. Milk and sugar will supply the calories. Roughly speaking, each ounce of milk contains 20 calories and each ounce of carbohydrate 120 calories.

The infant's requirements for the different components are easily met by a simple dilution of cow's milk. The essential protein requirements for the maintenance of life and the promotion of proper growth are contained in 1.5 to 2 ounces of milk per pound per day. The fat requirements are also contained in that amount of milk. One and one-half ounces of cow's milk will furnish sufficient mineral constituents to meet the baby's demand, with the possible exception of iron. The amount of carbohydrates required is equally easy to determine. Breast-fed babies get about 5.5 grams of sugar per pound of body weight or approximately 1 per cent of their weight. Cow's milk contains 4.75 per cent of sugar. It is therefore easy to estimate the amount of additional carbohydrate necessary. It is practically always safe to add 5 per cent of additional sugar and many babies will tolerate 10 per cent or more. The water requirements vary with the activity of the child, surrounding temperatures, frequency and consistency of the stools and vomiting. About 10 per cent of the body weight will meet all demands for water under normal conditions.

The fat-soluble Vitamins A and D must be added to the diet. Both are contained in cod liver oil. There is not sufficient Vitamin C in cow's milk to protect the infant from scurvy and that small amount is probably injured by boiling. This vitamin must be added. Orange or tomato juice will furnish it.

The choice of carbohydrates is not difficult. Theoretically lactose, the sugar of both human and cow's milk, should possess some advantages. Practically it is rarely used as large amounts tend to produce diarrhea. Because of its slow digestion and absorption, it reaches the lower portion of the digestive tract where fermentation gives rise to gas formation and hence increased peristalsis with frequency of stools. This property of lactose may indicate its use in children with a tendency towards constipation. It is more expensive than other sugars.

Cane or beet sugar is less expensive and is always available in the household. It will meet the requirements of most infants as it is quickly digested and absorbed from the intestinal tract. It is not as laxative as milk sugar, consequently

larger amounts can be used. It is the sweetest of the sugars available for infant feeding. Large quantities are not advisable as it may lead the infant to demand highly sweetened foods.

Mixed sugars containing dextrin and maltose are excellent. They are derived from starch which has been subjected to the action of malt diastaste or heat, especially in the presence of acid. The composition depends upon the length of time that the processes of conversion are allowed to proceed. If only for a short time there will be relatively large amounts of dextrin. If for a longer period, there will be more maltose and some dextrose. The mixtures of several sugars is of distinct advantage in that large quantities can be fed without producing signs of carbohydrate intolerance such as excessive gas formation, diarrhea or irritated buttocks. The advantage is due to the fact that where mixtures of carbohydrates are fed only certain of the component sugars may be fermented and consequently excessive gas formation at one time is not likely to occur. This is particularly true when dextrin, maltose and dextrose are added to a mixture which already contains lactose. There are several such sugars available in powdered or liquid form. Corn syrup belongs to this class of carbohydrates. It is the least expensive.

The use of such simple combinations of milk, sugar and water avoids the necessity of elaborate instructions for the mother. She need only be told to add the measured amount of carbohydrate to definite quantities of milk and water and boil. The mixture is divided into bottles representing the number of daily feedings. It should be kept cold until used.

The use of these simple milk mixtures is advocated. They will not solve all of the feeding problems that arise in the normal healthy infant. There are always enough questions arising to keep the physician from leading a monotonous existence. These milk mixtures are recommended because they are simple, inexpensive, require few additions, are most flexible and contain fewer possibilities for error with consequent harmful results.

DISCUSSION ON SYMPOSIUM ON PEDIATRICS

Dr. Thomas Myers (St. Paul): Much of the more recent work on epilepsy has been done by Minnesota men, and the only real advances in knowledge of the pathology and therapy of epilepsy of late years may be ascribed to Dr. McQuarrie, of the state University, and to Drs. Helmholz and Peterman at Rochester. They have demonstrated that this condition, so long a bugbear of medicine, is apparently a result of imbalance of the delicate and complex interrelationships existing between the components of brain cells. This refers particularly to the balance between cholesterol and lecithin, between sodium and potassium, and the proportion of water to solids, in the brain tissues. Disturbances of the normal equilibrium of these elements have been shown to be vitally associated with those explosive attacks which characterize the epileptic patient. Dr. McQuarrie has shown that by increasing the water dilution in the brain cells, seizures become more frequent, showing increased permeability of their cell membranes, permitting an increased inflow of water, with a corresponding loss of potassium as well as a disturbance of cholesterol content. Why some cases respond so well to dehydration treatment, while others are influenced by the ketogenic diet, and still others show response to neither type of attack, is still a mystery. Some attribute the success of the ketogenic diet largely to its small fluid intake. On the other hand, it has been demonstrated by Wilder and others that aceto-acetic acid, as well as its sodium salt, which are formed as a result of the ketogenic diet, have a definite sedative effect in epileptic convulsions.

The difficulty in applying diets based upon dehydration, fasting or high fat content, upon children, has made their use, outside of hospital practice, frequently impossible. It is to be hoped that the near future may reveal a method of application which may be used in a practicable manner.

Dr. Rowe has ably portrayed the advance made in infant feeding in recent decades. The greatest reduction in mortality has occurred in infancy and childhood, and this is in large part due to improvements in methods of infant feeding, as well as prophylaxis against the many ailments which formerly took such heavy toll in the early years of life. The past twenty years show a 50 per cent decrease in deaths resulting from malnutrition, improper feeding, enteritis, and similar disturbances. This is due to the teaching of simplified infant feeding to the physicians and laity; to the practice of maintaining breast feeding; to the improvement in handling cow's milk, which through boiling, pasteurization and adequate dairy sanitation has provided clean, uninfected milk to babies. Properly supervised tuberculin testing in cattle has almost completely eliminated the transmission of bovine tuberculosis via the milk, and pasteurization or boiling of milk completes the safeguards. As a result of these measures, pediatric practice is, to only a small degree, now concerned with nutritional disturbances or to intestinal infections.

The feeding of the newborn, often a neglected matter, can bear very positive improvement frequently. It is possible to reduce considerably the so-called physiologic weight loss of the first week, with its commonly attendant dehydration and fever, by giving complemental bottle feedings until the breast milk is adequate, and by offering the baby the breasts as early as the mother's condition permits. The practice of giving only one breast at a feeding, and only five occasions daily, often leads to delay in stimulating breast secretion, and in my experience can bear correction in many cases.

The ability of the normal infant to tolerate and digest solid food at an early date has been frequently underestimated. Nearly all infants are the better for offering cereal at the third month, and vegetables at five months. Such additions to the diet give the baby a more solid bony and muscular structure, and help to prevent rickets, anemia, and similar disturbances.

Dr. Ray Shannon (St. Paul): I think that we are exceedingly fortunate this afternoon in the committee's choice of speakers and subjects for this pediatric symposium. It would be difficult to imagine a more fortunate combination of the interesting with the practical than we have heard.

The subject of epilepsy has ever been a challenge to the medical profession. Little can properly be added to what Dr. McQuarrie has said. It is perhaps not impertinent to reemphasize a few points that seem to me to be important.

1. The classification of "essential epilepsy" is, like the old term rheumatism, becoming more limited as time goes on. Aside from the various organic brain lesions which have so frequently been diagnosed with these cases in the past, a number of so-called functional conditions that are capable of producing seizures that may well be confused with essential epilepsy are now possible of recognition and are amenable to a separate therapy. I refer to allergic disease, calcium deficiency and spontaneous hypoglycemia. No case should be classified as an epileptic until a most exhaustive search has failed to reveal either obscure organic disease of the brain, or any of these other conditions. It is to be hoped that time will still further limit the class of the essential epilepsies by permitting a further weeding out of other at present obscure metabolic irregularities.

2. While technical difficulties in application, if nothing more, stand in the way of success beyond a certain irreducible minimum, the type of thing that Dr. McQuarrie is doing represents the greatest advance that has yet been accomplished in the control of epilepsy. This is true for two reasons as I see it. In the first place it is not a form of treatment that is to supplant any previously recognized therapy, but may be used as an ally of any such measures. Secondly, while apparently arising in the beginning out of the field of empiricism, it seems to point forward toward the light of scientific understanding. After all, convulsions, regardless of type, are too similar in character for one to admit an essential cause as varied as the conditions under which they occur. It is much more reasonable to believe that some explosive upset in equilibrium or function within the cellular structure of the brain has occurred, and that this upset may occur in a large variety of general pathological conditions. It would seem to me that Dr. McQuarrie's work derives its greatest significance from the fact that it seems to lead toward an explanation of what this cerebrocellular explosion actually is. When he, or those who follow him, tell us what this is they will have gone far, not only in the solution of the problem of essential epilepsy, but also in the problem of the convulsive disorders in general.

I am sure that a paper such as Dr. Platou's is most opportune. The two questions of vaccination against and serum treatment for scarlet fever have been before the public mind sufficiently long so that an appraisal such as Dr. Platou has made may properly be undertaken.

From his figures there seems to be little doubt concerning the value of vaccination, properly carried out, with the naked toxin. A figure of 100 per cent efficiency seems too good to be true, and yet the variety of sources from which the figures were derived would seem actually to substantiate this almost unbelievable standard of efficiency. It dwarfs into insignificance any other of the extensively used methods of active immunization.

And yet, in spite of this remarkable record, I do not believe that the solution of the problem of scarlet fever lies in this method of vaccination. A 10 to 20 per cent of sharp reaction, even though such reactions *never* lead to serious consequences, will alone preclude the possibility of any such extensive use of this measure as, for example, may be attained with vaccination against diphtheria. Even the number of injections, five, will be a potent deterrent to a large number of the laity. From the standpoint of the medical man the very efficiency of the serum treatment will be a factor which will swing him away from the stand of imposing the penalty of vaccination upon his patients toward that of taking a chance on their getting the disease and using the serum if advisable. It is my firm belief that the ultimate solution to the problem of scarlet fever vaccination lies in the use of some form of modified toxin, such as a toxoid or a ricinoleated toxin, or perhaps in the ingestion of the naked toxin as more recently reported on by the Dicks.

At present Dr. Platou's practice is proper.

Concerning the serum treatment of scarlet fever, here again the conscientious physician must frequently pause and consider seriously the possibilities. There would seem to be no question as to the value of antitoxin given early in scarlet fever. While its value in preventing the late complications of the disease is less than in cutting short the primary toxemia it would seem that there can be no doubt that even the complications are reduced by the early routine use of serum. Had we only scarlet fever to consider we could use the antitoxin freely with a clear conscience. But we have *not* only scarlet fever to think of. We must keep in mind the possibility of a future diphtheria, or tetanus, or epidemic meningitis or any of many other diseases

which may call for the use of a horse serum, the way the present trend is going, to consider. The unnecessary use of a serum now may hinder the very necessary use of a serum at some future time because of an induced sensitization. A mild scarlet fever is frequently no worse than a mild sore throat. In the general run of cases such scarlet fever does not give rise to the severe complications. We cannot afford to waste our sensitizing injection of serum on such cases. I therefore believe that until we know more about allergy, and are better capable of coping with serum disease in all of its ramifications, we perform our function better as physicians if we reserve our serum treatment for other than the mild cases. Dr. Helmholz has presented something so new that it is not possible for me to discuss it intelligently. I have had no experience with it.

It would seem that its greatest application should be in the chronic forms of infections of the urinary tract, especially stasis. The acute forms are frequently of such short duration in children that its use here might not be so apt. This very mechanism may be an important factor in the rapid clearing of many of the acute cases. And it has been always a strenuous effort in therapy to prevent ketosis in the presence of fever by the giving of carbohydrate.

DR. C. A. SCHERER (Duluth): I would just like a moment to add a few words to Dr. Rowe's paper.

In the first place, concerning simplicity of infant feeding. I am inclined to think simplicity is rather a question of years of experience. In an exact science it is possible to develop formulas and equations and figure out absolute scientific facts, but I think when it comes to an art, the mastery of years of experience is of a good deal more value, and I hope physicians feeding infants won't take this simplicity too much to heart.

Dr. Rowe brought out one thing in which I have been greatly interested, and that is the time of the application of the newborn to the breast. Dr. Oeljen in St. Luke's Hospital in Duluth took this matter up. Very fortunately we had our two hospitals, in one of which the infants were put to breast fourteen hours after birth, and in the other twenty-seven hours after birth. Dr. Oeljen selected 200 charts in each hospital, analyzed them very thoroughly, and the results were quite definite.

The work is based on the reports of Willkomm and Hamburger of Dortmund and Reiprich of Cologne. They showed very definitely that the infant should not be put to breast under any circumstances until he was ready to go to breast. Hamburger suggested that the premature stimulation of the sucking reflex not only harms the baby but also deprives the mother of her time of rest, and that premature stimulation probably exhausts the sucking reflex. Therefore, he gave the child a twenty-four to forty hour rest, giving an opportunity to heal out the thirty-five per cent of injuries to the falx and the tentorium that are found postmortem but not clinically.

Dr. Olejen's figures show that the amount of breast milk received by the infant put to the breast after twenty-eight hours was smaller for the first two days than that received by the baby put to the breast in twelve hours. But the ten day total amount for the twenty-eight-hour baby was about forty grams per day greater than the ten day total received by the baby put to the breast at fourteen hours.

We also found that our discharge ratio in the fourteen-hour group was about thirty-nine per cent under birth weight, whereas in the twenty-eight-hour group only about twenty-two per cent were discharged under birth weight. The continuation of nursing we were not able to follow up, but the general trend of the investigation showed definitely that the twenty-four hours of rest given both the mother and the child was of great advantage to the production of breast milk and to the nursing ability of the infant. The nurses also reported—and this agrees with the findings of Hamburger and Willkomm—that there was not nearly the difficulty of teaching the child to nurse when put to the breast after it had wakened thoroughly and showed an inclination to nurse as there was when the infant was forcibly awakened and put to the breast before it was time.

BLOOD DISTURBANCES AND THROMBOGENESIS FROM CLINICAL INTRAVENOUS INJECTIONS OF DEXTROSE SOLUTIONS

In intravenous medication, more attention is often devoted to the details of technic of the injection than to the changes which may occur in the blood and in important physiologic functions following such administration. More important than such technical accessories is the important fact that agents, drugs or solutions so injected act as foreign agents in the blood stream. Recently reported results of intravenous dextrose solutions are timely, and worthy of the attention of all physicians who practice such injections. The most constant change which was reported was an acceleration of blood coagulation. Other changes were increases in glycolysis and of lactic acid, also variations in mineral content, disturbed albumin-globulin ratio with increase in thrombocytes associated with a decrease in their electrical charges, and agglutination of platelets. The reported results merit serious thought. Reports of deaths from intravenous dextrose injections have been published. In contrast to the experimental and clinical evidence cited is the commercial propaganda disseminated through the organs of proprietary manufacturers who advocate and exploit all sorts of substances and solutions for intravenous injection. It is unfortunate that credulous and uncritical physicians accept these claims and thoughtlessly jeopardize the lives of their patients. (Jour. A. M. A., December 12, 1931, p. 1800.)

CASE REPORT

ACUTE EPIDEMIC ENCEPHALITIS*

B. J. Cronwell, M.D.
Austin, Minnesota

Epidemic encephalitis in its various forms may simulate almost any of the sudden affections of the central nervous system. Some of its forms may readily be recognized by its own clinical manifestations rather than differentiation by exclusion of other diseases of the central nervous system. The sudden onset of a diplopia, followed shortly by headache, a low grade and irregular fever, with lethargy and asthenia, makes an easily recognized picture. The asthenia out of proportion to the fever and lethargy are prominent findings of this condition. The mental condition in these patients may change rather abruptly for either the better or the worse and just as suddenly return to its former state. In twenty per cent of cases the onset is insidious and slow, and, in addition to the aforementioned symptoms, there may be present at the onset any of the mental and nerve symptoms. Then there are others whose onset is similar to a cerebral hemorrhage.

Following is a case report of a woman twenty-five years of age, who on December 18, 1929, came in complaining of a shooting type of pain in her left hip and right ankle and of inability to sleep. She stated that the trouble started the first Monday in November when she had a pain in her right shoulder and arm, which lasted for one week. Two weeks later her right ankle became painful and she was still unable to sleep. One week later, the left hip became painful, which persisted. From that time on the patient considered herself gradually getting worse.

This patient's past history records that when quite young she had a pneumonia, complicated with an empyema which was drained. In the summer of 1929, she stated that her head ached severely and that at times she would see black spots before her eyes. She further stated that towards evening things would seem double. Her husband stated that in late summer and early fall, when spoken to she hesitated in answering.

The physical examination revealed a white female twenty-five years of age, weighing 135 pounds, well nourished and developed, who appeared to be in some pain. Blood pressure was 126/84. Inspection of the head showed the eyes sensitive to light, the pupils dilated but reacting readily to light and accommodation. There was an obliteration of the naso-labial folds. The muscular action was equal upon both sides of the face. The skin of the face had a pallor and was somewhat shiny. The teeth were in good condition; the tongue dry and coated and the pharynx was negative. Examination of the neck demonstrated no rigidity or palpable adenopathy. Brudzinski sign was negative. The chest gave no particular findings except an increased heart rate of 100 beats per minute. The reflexes were brisk in all quadrants of the abdomen. The reflexes of the upper extremities were increased. In the lower extremities the left sciatic nerve region was tender, which did not seem to be related to motion of th part. The patellar reflexes were both brisk, with a suggestive Babinski on the left. Rhomberg's sign was negative.

After being put at absolute rest in bed in the hospital, and after the application of heat to the left leg, the pain disappeared. The mask-like facial expression and scanning speech then became more noticeable. The third day the patient was quite drowsy and her headache worse. A lumbar puncture was made, and clear spinal fluid obtained under moderate pressure, giving a positive globulin test and twenty-two cells per cubic millimeter. The University laboratory reported acute epidemic encephalitis upon guinea pig inoculation. A course of eight intravenous injections of 0.5 per cent neutral acriflavine was given. The patient claimed relief the morning following the first injection of acriflavine. The improvement was marked and she was allowed to return home on the completion of the course. The reflexes at this time were brisk and the left foot had a suggestive Babinski sign.

During the first two weeks at home the progress of the patient was satisfactory. After this period she started to complain of headache and a heavy feeling in the left side of her head. Her temperature at this time was quite irregular. Her relatives requested consultation and the patient reported to Dr. W. H. Hengstler on February 6, 1930, who advised the further use of eight daily doses of 0.5 per cent neutral acriflavine intravenously. After this course of treatment the patient felt fine and gained sixteen pounds in weight during the next three months.

From July 27, 1930, the patient complained of many headaches, especially after reading or sewing. It was found that she had lost five pounds in weight. She was given a course of salicylates and seemed to gain some relief for a short time. From this time until September 12, 1930, the patient's temperature was quite irregular, there was a progressive loss of weight, and the headaches came more often. Another course of acriflavine was given without relief of symptoms. Further consultation was requested. Dr. Moersch then saw the patient at the Mayo Clinic and made the statement that the central nervous system was now devoid of findings. The mental attitude of the patient was better from that time.

The patient has been doing very nicely and was seen January 9, 1932, when two months pregnant. On April 7, 1932, she delivered a markedly macerated fetus. In spite of some elevation of temperature during the early puerperium, after three weeks of rest in bed she was apparently again normal.

*Read before the annual meeting of the Minnesota State Medical Association, Saint Paul, May 25, 1932.

PRESIDENT'S LETTER

IT IS to the credit of medicine that it has no secrets. Progress and advances are reported at once, sometimes, unfortunately, before being fully proved, and are made available to all members of the profession. Patents are taboo unless, as in the case of insulin, they are taken out in the name of a university and the profits, if any, are used for the advancement of medicine and thus for the benefit of mankind. The chances are that all the originator of any new procedure in surgery, of any new method of diagnosis or treatment in internal medicine, or of any new hormone will get, is the distinction accorded him by his confreres, and the credit of priority in medical literature. In the case of Banting, of Toronto, who discovered insulin, a proud and grateful government gave recognition in a more substantial although modest form.

In few other lines of endeavor is there such a free and enthusiastic recognition by their confreres of the efforts of those who strive for eminence in their work. Such a spirit is priceless and should be fostered. One often hears the remark that there are too many medical meetings, that there are too many medical journals, and that there are far too many articles written, and that some method should be devised to limit all this. It would seem that the medical profession, along with other lines, suffers from overproduction in most of its activities. We are also informed that there are too many doctors of medicine and that something must be done to limit the production. There is much truth in all these criticisms, but the solution of the problem is not so simple. Perhaps the real answer will be decided by economics.

Minnesota has long stood in the vanguard of medicine, due to the ambitious, eager, and enthusiastic type of members in our state society. From the early days medical meetings have been enthusiastically attended. The stimulation of contact with friends who are in the same line of work, bringing with it exchange of experiences and the opportunity of listening to words of wisdom from those who have toiled long and earnestly, all go to make medical meetings one of the most valuable means we have to keep up general interest, and to furnish a stimulus to progress. Not least of the advantages, by any means, are family friendships that result when wives of the members are taken to these meetings.

In September, the Southern Minnesota Medical Association and the Northern Minnesota Medical Association each held its annual meeting. These two societies have a definite and useful field. With but a day or a day and a half for the meeting, little time is lost by those who attend, especially in these days of splendid highways and modern motor cars. The programs of these associations are devoted to scientific medicine. The economic phase, which looks so troublesome, is left to the state association to worry over, and the members enjoy, in their full, discussions of the everyday problems of practice. For such societies as these to liquidate would be a great loss. Ups and downs in their existence will occur, but the organizations should be supported and their function maintained.

The Southern Minnesota Medical Association, as it exists today, is the result of amalgamation of the old Southern Minnesota and the Minnesota Valley societies. The Northern Minnesota Medical Association is a younger society but fulfills for the northern portion of our state the same function as does the Southern Minnesota Medical Association for the lower tiers of counties. A more accurate definition of their boundaries, according to county and district societies, might be worked out to advantage, and would give them both more official recognition in the field of organized medicine.

M. A. Henderson.

President,
Minnesota State Medical Association.

EDITORIAL

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CARBOHYDRATES IN DIABETES

The general practitioner who is called upon to treat a diabetic patient is very likely to be confused as to just what actually is the best combination of carbohydrate, protein and fat. Writers on the subject have had most conflicting ideas.

Before the advent of insulin the problem demanded extreme reduction of carbohydrates to render the patient sugar-free, and safe ketogenic to anti-ketogenic ratio was an important consideration.

With the discovery of insulin the problem assumed a different aspect. Starvation was no longer necessary and the extremely low carbohydrate and high fat diets so unpalatable for the patient became no longer necessary. The pendulum swung to the other extreme. Some writers, notably Sansum, advocated a diet containing corbohydrate of 300 to 400 grams a day—what many normal people consume—with the administration of insulin in large amounts.

The pendulum seems to have acquired its middle point at present. It is common sense that a diabetic diet should resemble as nearly as possible that of the normal individual. Sufficient protein to more than spare body protein (60 to 80 grams), sufficient carbohydrate (100 to 140 grams) to make the diet palatable and not too expensive, and fat sufficient to make up the required calories to maintain a proper body weight. Insulin, if required, is taken in sufficient amounts and at the necessary intervals to maintain the patient sugar-free. On such a diet, with or without insulin, the probability of an acidosis need not concern patient or physician, providing no infection occurs and the patient remains sugar-free.

Dieting, then, is still necessary, the patient still has to be instructed how to plan a diet and has to be encouraged to maintain the diet and to check his status from time to time. Individuals will be found who seemingly cannot be kept sugar-free even on greater restriction of diet than that outlined above and intercurrent infections will practically mullify the action of insulin temporarily.

The fundamental consideration in the treatment of diabetes remain unchanged. The patient is probably less likely to develop the late complications of diabetes and his sugar tolerance is better if his blood sugar is kept within the normal range.

THE CANCER PROBLEM

While little is known about the cause of cancer, and its treatment is far from satisfactory, this is no excuse for relaxing in our efforts to combat this destroyer of human happiness.

Cancer is probably on the increase. This is in part due to the fact that more individuals reach the cancer age. Certain it is that cancer is more accurately diagnosed today than a generation ago.

We do know that certain forms of irritation are likely to lead to cancer. We also know that the earlier cancer is detected the better the chance of cure with the means at our disposal. The

method of attack is clear—the prevention of tissue irritation and early diagnosis.

Certain forms of cancer appear in the readily accessible parts of the body—the mouth, skin, breast, cervix and rectum. It is here that it can be detected early and in many instances prevented. The public is well informed of the importance of oral hygiene, although too many are unable to obtain proper dental service. The importance of the visual examination and treatment of the post-partum cervix has not been sufficiently appreciated by the profession and as a result by the laity.

When it comes to the detection of early cancer of the breast, education of the public is essential. In a recent circular letter to the state medical journals, Dr. Bloodgood of Baltimore brought out some interesting data about breast cancer. He states that if 1,000 apparently normal women are examined, 1 per cent will be found to have cancer of the breast. This number will have a 70 per cent chance of cure. Three per cent of the 1,000 examined will be found to have lumps in the breast which are not cancer, and as many as 25 per cent will be found to have lumpy conditions of the breast which have nothing to do with cancer. If, on the other hand, 1,000 women who think they can feel a lump in the breast are examined, as many as 10 per cent will be found to have cancer and these women will not have a 70 per cent chance of cure. An additional 15 per cent of these women will be found to have non-malignant lumps in the breast. This is a rather strong argument for Dr. Bloodgood's advocacy of periodic examinations. That some progress has been made through dissemination of information to the laity is shown by the fact that only 10 per cent of the women who come to his clinic now are found to have cancer, whereas, in 1900, Halstead found cancer in 80 per cent of such examinations.

When it comes to hidden cancer the outlook is not so bright. Cancer of the bronchi is on the increase, and why we do not know. Its treatment is most unsatisfactory. Early diagnosis of cancer of the stomach is worth the diagnostic effort because of its occasional operative cure. The operative treatment of cancer of the rectum makes its early recognition worth while.

There is need for intensive research in the cancer field. The New York Laboratory at Buffalo probably ranks first in cancer research. The United States Public Health Service has its research laboratory at Washington and in conjunction with the Harvard Medical School. There is need for the numerous cancer clinics, such as the one at the University of Minnesota medical school. The Veterans Bureau has established a large one at Hines, near Chicago. There is need for the necessary hospital and clinic equipment of radium in sufficient amounts, deep therapy X-ray machines and a competent radiologist. But what is needed most of all is more early diagnosis of cancer which can only result from early consultation when suspicious symptoms arise, and careful examination on the part of the physician.

COMMUNICATION

Duluth, Minnesota
September 8, 1932

Dr. E. A. Meyerding,
11 West Summit Ave.,
St. Paul, Minn.

Dear Doctor Meyerding:

One A. L. (Jerry) Castle, alias Ernest Donald Roberts, pretending to be a physician on vacation from Honolulu, recently victimized a number of Duluthians. His method of approach was through the internes of a local hospital to whom, for a period of some 3½ weeks, he was extremely gracious and whom he entertained generously and at times lavishly. Following his sudden departure, a crop of bad checks has come into bloom.

The man claims to be Welsh and to have had his training in England. He speaks English, French, German and Greek and has a foreign accent. His knowledge of medicine and of outstanding medical men is surprising and convincing even to the medical mind. His manner is extremely gracious and polite. His conversation shows him to be well conversant with music and literature as well as medicine. He entertains well on the piano and with stories. Among other things polo is a favorite game of his and he rides well.

The high lights of his physical appearance are fairly covered by the following: Well dressed; black mustache; dark hair; swarthy complexion; age, about thirty years; height, 5 feet, 8 inches; weight, 150 pounds; eyes, hazel gray; nose, inclined to the Roman; teeth, unusually white and even. All in all, he looks like a German Jew.

As recently as four days ago he was known to be in Minneapolis.

No doubt, other hospitals, medical centers, and physicians will be victimized, wherefore I am writing you this letter.

Yours very truly,
(Signed) M. McC. FISCHER,
Director of Public Health.

VITAMIN C—THE ANTISCORBUTIC VITAMIN

Of late, progress toward the isolation and identification of some of the vitamins has been greatly accelerated. According to Rygh and his co-workers, the antiscorbutic vitamin can be produced from the long known alkaloid narcotine and is presumably so derived in nature. Unfortunately, the experimental results and conclusions of these investigators have failed of confirmation by a number of scientific workers both here and abroad. King and his associates venture to identify Vitamin C with the hexuronic acid found by Szent-Györgyi in various plant tissues and in the suprarenal structures. These biochemists have isolated from orange juice a crystalline product that is protective to the conventional laboratory test animal, the guinea pig, in daily doses of 0.5 mg. If the claims are further substantiated, as now seems likely, a great step in advance will have been taken. In any event, further specific knowledge regarding the precise etiology and cure of scurvy cannot fail to result from these trends in research. (Jour. A. M. A., August 20, 1932, p. 658.)

MISCELLANEOUS

SOCIAL INSURANCE IMPOSSIBLE TO ABOLISH WHEN ONCE ESTABLISHED

EDWARD H. OCHSNER, M.D.
Chicago

The worst feature of Social Insurance is the fact that when this parasite once gets its suckers well fastened into the vitals of a nation nothing short of either national bankruptcy, a dictatorship, or a revolution will be able to loosen its hold.

Germany, which has had Social Insurance on its statute books the longest, has for a considerable time been on the verge of bankruptcy. While other facts are operative, we believe that the billion dollars which Social Insurance costs the nation every year is one of the chief reasons why Germany is unable to make a satisfactory "come-back" to normalcy.

England is not much better off. The chief reason for England's present difficulties is the terrific burden of taxation which she has to carry. One writer says: "A complete understanding of the problems confronting England at the present time involves going back to 1909 when we had just adopted old age pensions and destroyed the foundations of thrift." In 1911 England introduced National Insurance when three per cent of its workers were unemployed. After twenty years of operation of the act, seventeen per cent of her workers are out of work. As a partial explanation for this condition let us cite just one example from among scores and hundreds that could be given. A manufacturer found that his orders were only sufficient to give work to all his employees four days a week so he called his workers together and told them the facts. The workers, however, insisted that they would work only three days a week in order that they could draw the dole for the other three days. An English writer commenting on this says: "It is a great mistake to worry about the much discussed abuses of the system. It is the system which is fundamentally wrong and abuse is inseparable from it."

To get an idea of the tax burden which England is carrying, we need but cite facts. In that country all incomes of seven hundred and fifty dollars per annum are taxed twenty-five per cent. Higher incomes carry an additional surtax. Increased taxes have increased the production-cost of practically all articles of manufacture and, as a consequence, have actually increased unemployment because English Industry carrying this extra burden has not been able to compete with other countries in the world markets. In spite of these burdensome taxes and in spite of the fact that living expenses had gone down eleven and one-half per cent, the recent labor government refused to cut the sick benefits ten per cent and put the nation to the expense and turmoil of a national election practically on this issue alone.

The countries just cited are not the only ones encountering similar difficulties. A recent newspaper article contained the statement that there are more than one hundred and fifty federal boards and commissions in Washington each with three or more members drawing salaries and each with a bevy of clerks most of them just drawing salaries. Many of these were created during the World War. When a few far-sighted individuals remonstrated against the appointment of so many boards and commissions they were assured that they would all be abolished at the end of hostilities. It is now more than fourteen years since the signing of the Armistice but not one board has as yet been abolished.

Another illustration is the franking privilege to country newspapers. This privilege was extended to them when it was deemed desirable to disseminate news and information to rural inhabitants, particularly to detached settlements. It was a wise and legitimate enactment at the time but now it is just a plain nuisance and yet no congressman would dare to suggest its abolition. It is costing the taxpayer and consumer a great deal of money and serves no useful purpose. A town of ten thousand and even fewer inhabitants usually has two and sometimes three local papers all enjoying this privilege. The local merchants are compelled to advertise in all of them, the expense of which must of necessity be passed on to the consumers. Incidentally this favors the mail order houses to the detriment of the local merchant.

There are many reasons why it is almost impossible to repeal the laws governing such practices. One reason is that executives and legislators do not want them repealed because it reduces the power which they derive through political patronage. The more patronage the individual in office has at his disposal, the more difficult it is to dislodge him. Even today it is very difficult to defeat a public officeholder with large political patronage, no matter how inefficient he may be, except by another who either already has large political patronage or who promises jobs to his supporters irrespective of their qualifications. Thus in many elections the voter is simply left to choose between two undesirable candidates. Already the number of payrollers has become so large and so politically active and influential that they wield great power in both political parties. If we then add compulsory health insurance we will add further thousands to the lists of our civil employees. Those who are not in government employ will be powerless to control government and their only function will be to pay the taxes which others impose upon them. Instead of increasing the number of government officials and employees, the ideal to be constantly kept in mind and striven for in this country is to permit the private citizen to perform all those functions that he can best perform and that make for independence, sef-reliance, and strength of character and to have the government do only those things which the individual cannot do satisfactorily. We maintain that centralization in government and paternalism have already gone much too far and that Social Insurance would simply be another step in the wrong direction.

Another reason why it will be difficult to repeal such laws is the fact that men in the different services of the government do not dare to expose its faults for fear of being accused of disloyalty. Reports must be couched in the most mild and ineffective language possible and then they must not be released to the public but allowed to die as still-births in the departments. We all know what happened to General Mitchell, who dared to disregard these rules. Major-General Robert Alexander also tells in the introduction to his Memoirs of the World War just how this worked in at least one other instance.

In most countries which have Social Insurance such laws were first suggested and urged by welfarers, uplifters, and visionaries who unwittingly played into the hands of practical politicians. Even now few seem to realize that bureaucracy in a republic may become just as unreasonable, oppressive, and ruthless as a despotism.

It will be interesting to see whether we shall be able to profit by the experience of others or whether as a nation we belong to that class of human beings who can learn only by dire personal experience or from national disaster. (The next article will offer a number of counter-suggestions in place of Social Insurance.)

OF GENERAL INTEREST

Dr. Lawrence M. Larson, formerly of the Mayo Clinic, Rochester, Minnesota, is now associated with Dr. Martin Nordland, Minneapolis, in the practice of surgery and surgical diagnosis.

Dr. J. C. Litzenberg, professor and head of the department of obstetrics and gynecology at the University of Minnesota medical school, was elected president of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons at the organization's annual meeting at French Lick Springs, Ind.

The Mineral Springs Sanatorium held its annual dinner meeting at the sanatorium at Cannon Falls for physicians of the district, August 25. Speakers were: F. L. Jennings, Glen Lake Sanatorium; L. G. Rigler, University of Minnesota; B. R. Kirklin and W. S. Harrington, Rochester, and J. Morrow, Austin.

Dr. Margaret Warwick, formerly of the Department of Pathology of the University of Minnesota and the Miller Hospital in Saint Paul, now pathologist to the Millard Fillmore Hospital in Buffalo, N. Y., was married on September 19, 1932, to Dr. R. Montfort Schley of Buffalo, N. Y. She will continue her work at the hospital and will live at 610 Potomac Avenue.

An exhibition of a motion picture film entitled "Birth" was recently given before a group of officers and members of the Hennepin County Medical Society. The film was produced in Switzerland, and its purpose is to encourage prospective mothers to consult regular physicians or recognized hospitals. The physicians who viewed the film expressed the opinion that there was nothing in it that would be objectionable for public exhibition, and that it had definite educational value.

EXTENSION COURSE IN TUBERCULOSIS

Dr. J. A. Myers, Professor of Preventive Medicine at the University of Minnesota, and Chief of Medical Staff of the Lymanhurst School for Tuberculous Children, has arranged with the Extension Division of the University of Minnesota to offer a course of seventeen lectures on tuberculosis to graduate physicians this year.

These lectures have been planned in response to requests from a large number of busy practising physicians who wish to inform themselves thoroughly on the rapid modern advances in the management of pulmonary tuberculosis and allied conditions. The lectures will begin Thursday, October 6, 7:30 to 9:30 p. m., in the Eustis Amphitheater at the University and continue at the same hour weekly for the seventeen weeks of the semester.

1. Diseases of the lungs, including diagnosis and treatment of septic conditions such as bronchiectasis and pulmonary abscess.
2. Demonstrations of iodized oil administrations.
3. Treatment of bronchial asthma associated with hay fever, etc.
4. Diagnosis of pneumoconiosis, with particular reference to silicosis as found among stone cutters.
5. Carcinoma of the lung, with special reference to diagnosis.
6. Tuberculosis presented in its various manifestations from the beginning of the first infection type through all stages to termination with reinfection type.

The course will cover all forms of treatment. Considerable illustration by X-ray film, demonstration of modern diagnostic procedures and administration of therapeutic measures is planned. Ample opportunity will be allowed, also, for examination of patients.

Registration should be made as soon as possible with Mr. R. R. Price, Extension Division, University of Minnesota. The registration fee, $10.00, will cover all expenses of the course.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

MEDICAL BROADCAST FOR THE MONTH

The Minnesota State Medical Association Morning Health Service

The Minnesota State Medical Association broadcasts weekly at 11:15 o'clock every Wednesday morning over Station WCCO, Minneapolis and Saint Paul (810 kilocycles or 370.2 meters).

Speaker: William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota.

The programs for the month of October will be as follows:

October 5—Coronary Disease.
October 12—Hearing Tests.
October 19—Prevention of Rickets.
October 26—Advances in Plastic Surgery.

AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

Announcement of Coming Examinations

The next written examination of the American Board of Obstetrics and Gynecology will be held on Saturday, October 22, at 2 p. m., in 19 different cities of the United States and Canada. In order to reduce traveling expenses for candidates special arrangement may be made through the Secretary for taking the written examination at any city other than those regularly specified where there is a Diplomate who can be empowered to conduct the examination. This arrangement does not apply to the general, clinical examination.

The next general, oral and clinical examination, is to be held in conjunction with the meeting of the Pacific Coast Society of Obstetrics and Gynecology at Los Angeles, California, on December 7, provided there are sufficient applicants.

The only reduction in railroad fares that will be available will be possible seasonal or round trip special rates. Information regarding this should be obtained from any railroad agent. The candidates will have the opportunity also of attending the scientific sessions of this society, as the examination is scheduled for the day preceding the opening of the session.

Applications for these examinations should be filed immediately. Lists close for Group B applicants (see booklet) on October 5, and for Group A applicants on November 15.

For application blanks and other information, address Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

AMERICAN COLLEGE OF SURGEONS

The twenty-second annual Clinical Congress of the American College of Surgeons will be held in St. Louis, October 17-21, with headquarters at the Jefferson Hotel. Dr. Franklin H. Martin, Director-General of the College, informs us that an instructive program of operative clinics has been prepared by the local Committee on Arrangements, of which Dr. Evarts A. Graham is Chairman.

Hospital standardization conferences under the direc-

tion of Dr. Malcolm T. MacEachern will be held during the first four days. Four special programs have been prepared dealing respectively with fractures, curability of cancer, industrial medicine and traumatic surgery, and the teaching of surgery and the surgical specialties. Medical motion pictures will be on daily exhibition.

On Monday evening the president, Dr. Allen B. Kanavel, will present his retiring address, "Intangibles in Surgery," and turn over the robes of office to the incoming president, Dr. J. Bentley Squier, who will deliver his inaugural address, "Fundamentals of Specialism." The John B. Murphy oration in surgery entitled, "Pillars of Surgery," will be delivered by Sir William I. DeCourcy Wheeler, M.S., F.R.C.S.I., Dublin, Ireland.

On Wednesday evening a Community Health Meeting will be held with brief instructive talks dealing with personal health and hospital matters.

On Friday evening the convocation will be held for the incoming Fellows, and the Fellowship address on "Some New Things in Physics" will be delivered by Robert Andrews Millikan, Ph.D., LL.D., Sc.D., Nobel Laureate. Dr. J. Bentley Squier will deliver the presidental address entitled, "The American College of Surgeons—Twenty Years of Ambitious Effort."

Among the features of the evening meetings will be the oration on fractures by Dr. Philip D. Wilson and the oration on industrial medicine and traumatic surgery by Dr. Frederic A. Besley. A special program on ophthalmology and otorhinolaryngology will be held at the Statler Hotel and there will be clinics on these subjects during the entire week in the St. Louis hospitals.

Among the other foreign visitors will be Sir George Lenthal Cheatle, London, and Dr. José Goyanes, Madrid.

SCOTT-CARVER COUNTY SOCIETY

B. H. Simons, Chaska, was elected president of the Scott-Carver County Medical Society at the recent annual meeting held at the Commercial Hotel, Chaska. Other officers are: F. H. Buck, Shakopee, vice president; C. F. Cervenka, New Prague, secretary-treasurer; W. S. Emmerson, Mayers, and T. P. Martin, Arlington, delegate and alternate, respectively, and F. C. Westerman, Montgomery, H. E. Wunder, Shakopee, and M. B. Hebeisen, Chaska, censors.

Speakers on the scientific program were Robert Rizer, Minneapolis, and Harry Bayard, Minneapolis.

Archa Wilcox, Minneapolis, addressed the August meeting of the society held at Montgomery, August 9.

REDWOOD-BROWN COUNTY SOCIETY

F. C. Gibbons, Comfrey, J. A. Myers, Minneapolis, and Walter H. Ude, Minneapolis, presented the scientific program that marked the annual meeting of the Redwood-Brown County Medical Society. Tuberculosis was the subject of discussion. The following officers were elected: O. J. Seifert, New Ulm, president; Albert Fritsche, vice president, New Ulm; W. A. Meierding, secretary-treasurer; Theodore Hammermeister, New Ulm, and William McLane, Sleepy Eye, delegate and alternate, respectively; A. P. Goblirsch, censor.

SOUTHWESTERN MINNESOTA SOCIETY

The Southwestern Minnesota Medical Society met at the new Indian School Hospital, Pipestone, Minn., Sept. 20, 1932. At 6:30 P. M. a banquet was served, after which a program was given by the Indian children of the school, including two numbers by the Girls' Glee Club, Indian dances by the Indian boys in their native costumes and two solos by Owen Lightfoot, who was also dressed in Indian costume.

The following officers were elected: Dr. J. T. Rose, Lakefield, president; Dr. H. DeBoer, Edgerton, vice president; Dr. E. G. McKeown, Pipestone, secretary-treasurer. Dr. S. A. Slater was elected delegate to the State meeting, and Dr. C. O. Wright alternate.

The following doctors were elected as censors for three years: Dr. C. P. Dolan for Nobles County; Dr. L. A. Williams for Murray County; Dr. Walter Halloran for Jackson County.

The following Sioux Falls doctors gave the program:

Dr. T. J. Billion—"Hypothyroidism with Case Report."
Dr. M. A. Stern—"Appendicitis in Children."
Dr. G. E. VanDemark—"Foot Posture."
Dr. N. J. Nessa—"X-ray Studies in Diseases and Injury of Joints."

STEARNS-BENTON AND UPPER MISSISSIPPI SOCIETIES

The Stearns-Benton and the Upper Mississippi Medical Societies will hold an important joint meeting at Little Falls, Saturday evening, October 22.

The meeting will be preceded by a meeting of the Council of the Minnesota State Medical Association and council members will provide the subsequent program. Speakers are: M. S. Henderson, Rochester; H. Z. Giffen, Rochester; J. M. Hayes, Minneapolis, and W. A. Coventry, Duluth.

MINNESOTA MEDICAL ALUMNI HOMECOMING PROGRAM

Eustis Auditorium, Elliot Hospital
October 28, 1932

9:00 A. M.—Dr. H. P. Ritchie, Speaker.
9:00 A. M.—Non-specific Prostatitis.
Dr. D. Creevy
9:30 A. M.—Mechanics in Genecology or Posture in Relation to Diseases of Women.
Dr. William Rumpf
10:00 A. M.—The Recurrent Goiter.
Dr. Martin Nordland
10:30 A. M.—Painful Feet in Adults.
Mr. M. S. Henderson
11:00 A. M.—Medical Treatment of Acute Sinusitis.
Dr. K. E. Phelps
11:30 A. M.—Manual and Visual Examination of the Rectum.
Dr. H. E. Hullsiek
12:30 P. M.—Lunch—University Hospital
Dean Scammon
Dr. H. Dunn
Business Meeting.
2:00 P. M.—Dr. E. D. Anderson, Speaker.
2:00 P. M.—Skin Clinic.
Dr. C. A. Boreen
2:30 P. M.—Diseases of the Genito-Urinary System in Infants and Children.
Dr. R. E. Nutting
3:00 P. M.—Department of Medicine.
3:30 P. M.—Serial X-ray Plates in Gastro-intestinal Studies.
Dr. R. Morse
4:00 P. M.—Treatment of the Ambulatory Cardiac Patient.
Dr. Moses Barron

All medical men, who are interested, are cordially invited to attend this meeting.

PROCEEDINGS---MINNEAPOLIS SURGICAL SOCIETY

THE PROBLEM OF CANCER TREATMENT*

J. Frank Corbett, M.D.
Minneapolis

As a valedictory it is my purpose to bring before you the problem of cancer treatment. The subject is somewhat chaotic to me and I believe is to some degree to all of you. It is with the hope that this organization may take steps to give a better orientation to its members that I am determined to address you. It is obviously impossible to enter a comprehensive discussion of the literature. The question in the minds of those best informed might be likened to a poorly charted sea. However, there are a few facts that seem to be definitely established. Constructive committee work of this Surgical Society, articulating with similar organizations, could formulate a great deal of importance to all surgeons. The literature is so voluminous and even contradictory that some such means of editing seems imperative.

The purpose of such activity would be to educate all of us in the principles of cancer treatment. The American Society for the Control of Cancer has organized local committees as well as state committees. The function of local committees is given as follows: "They play important and active part in that they give information to the public on cancer and existing facilities for its treatment; coöperate with health officers and chairmen of Cancer Committees of State Medical Societies and in many ways coördinate further various educational activities for more efficient control of malignancy. Additional chairmen will be appointed as local conditions warrant."

This apparently concerns not only the public but also the doctor. Bulletins at a cost of $1.00 per year are issued on purely technical matters that concern both diagnosis and treatment. This material is condensed but is of value so far as it goes. For example, the article, "Newer Development in X-ray Therapy of Cancer[1]," gives a bird's-eye view of X-ray treatment. Many other excellent articles are given for the advancement and diffusion of knowledge among surgeons.

To the real student of cancer, the *American Journal of Cancer*, the official organ of the American Society for the Control of Cancer and the American Association for Cancer Research, offers many original articles and abstracts of a great many more.

It is my desire to bring before the Surgical Society the advisability of organizing a local committee on cancer similar to the fracture committee. To this committee could be added the names of roentgenologists, physicists, gynecologists, and surgeons representing each hospital in Minneapolis.

The importance of early diagnosis has been well broadcast to the public. The laity are doing their part. However, Dean Lewis has stated that only 20 per cent of stomach carcinoma is operable at the time chosen for operation. Many of us see cases of breast cancer with axillary metastasis and occasionally a cancer en cuirasse. Many of these have long histories. Early cases offer a good chance of cure, but intelligent laymen often do not appreciate this.

To the doctors, the organization and supply of an armamentarium is fundamental, as well as knowledge of how to use this. It is my belief that our local equipment is not well organized and to some degrees does not exist. To elaborate this last statement it is only necessary to state what everyone knows, that the treatment of cancer comprises two procedures, *i.e.*, surgery, and the use of X-ray or radium. The surgical rules, one might say, are established. Certain kinds of cancer are primarily operable; certain kinds require adjuvant X-ray or radium treatment; and certain kinds should best be treated by radium alone. For example, Recasens[2] states that cancer limited to the cervix may be treated by surgery or radiation. Radiation is contraindicated only in groups that lack radiosensitivity as can be determined by histological methods. He further states that border-line invasions should first have radium and later surgery, and that in advanced cases radium is the only choice.

The lymphatic supply of the breast has been well studied and is fairly definite, but the direction cancer cells take in these channels is subject to individual variation. It is manifestly impossible to remove all the lymphatics at operation, and the complete dissection of all axillary and cervical glands is a formidable process, removal of all the glands being impossible. Fortunately surgery can be helped by radiation.

In the discussion of the subject at the last meeting of the Western Surgical Society, there seemed a definite tendency to favor supplementary radiation of untouchable regions following operation. By this means the deep lymphatics through which cancer spreads to the bones or the chest can be blocked. This statement is based on the opinion that bone metastases are lymphborne, as has been promulgated by Carnett.[3] In addition, operations are seldom followed by local recurrences, or immediate metastases, as might be expected if embolic masses were liberated by rough handling. Recurrences from breast cancer are in the spine, the long bones, the pelvis, and the lungs. Garnett and Howell state that of 204 breast cases treated, 49 per cent gave evidence of bone metastasis. Himmelman's figures of 42 per cent of breast cases alive for three years and 36 per cent alive after five years serve as an example.

With the purpose of emphasizing the necessity for organization of a large supply of radium, I will quote Warwick.[4]

Warwick describes a technic for cancer of the breast which combines the advantages of surgical destruction of the local growth with the advantages of radium in attacking the lymphatic spread under supraclavicular triangle, and the anterior extremities of the upper intercostal spaces. A radical breast operation, where this is possible, is followed by the insertion of radium needles as follows:

"A. One 1.5 mg. (2 cm. long) needle above the first rib anterior to and below the axillary vein after clearing out the minute pocket in this situation."

"B. Two 3 mg. (4 cm. long) needles above the clavicle. These inserted through the skin of the supraclavicular triangle with a guiding finger in the axilla protecting the plexus and vessels."

"C. Four or five 2.5 mg. (3 cm. long) needles on each side into the anterior extremity of the upper four or five intercostal spaces. On the side of the operation they are placed between the intercostal muscles, and on the opposite side they are inserted through the skin after closure of the wound."

"D. Ten to twelve 3 mg. (4 or 6 cm. long) needles between the intercostal muscles of the upper spaces, covering the chest wall between the sternal needles and the point of exit of the lateral thoracic nerves."

"E. Four or five 3 mg. (4 or 6 cm. long) needles directed posteriorly between the intercostal muscles in the upper spaces from the points of exit of the lateral cutaneous nerves. In the first space a shorter needle may be used."

"F. Four 3 mg. (4 cm. long) needles in the axilla, two anterior to the plexus, stitched to the posterior surface of the clavicular head of the pectoralis major with fine plain catgut, and two behind the plexus stitched to fascia over subscapularis."

*President's Address, read before the meeting of the Minneapolis Surgical Society held May 5, 1932.

"G. Two or three 3 mg. (4 cm. long) needles are stitched in the epigastric angle."

With C, D and E the needle point may be seen to be raising the thin intercostal muscle while it is being inserted beneath it. The radium needles are removed a week later under gas and oxygen anesthesia.[5]

A more feasible use of radium is described by Lockwood.[6] The total amount used is 1,200 mg. hours as needles on the outside of the skin.

With this in mind, the control of a large amount of radium and the proper distribution of radium are paramount. When the radium emanations are available, the problem is simplified. I cannot enter into a debate as to the relative merits of actual radium and radium emanation. To surgeons of Minnesota, except the University Hospital and Mayo Clinic, the use of emanation is almost a closed book. Chicago is prevented from furnishing such emanation because of certain districting restrictions. New York is the nearest station. All emanations deteriorate with time and the degree of deterioration has to be established by a physicist. If emanations are desirable, then a central plant for collection is a much needed institution. Here the surgeon and the physicist could coöperate and no valuable time be lost. The physicist can go far but the treatment is dependent to a degree on information that the surgeon alone can supply, for the following reasons: Cancers vary in their physical structure and all kinds do not react the same to radium. The histological structure of the tumor, its vascularity, amount of connective tissue and cellular character are variable. Not only is coöperation necessary but a clearing house of the data is necessary to definite knowledge.

The question of records is important. Simply to state that so many carcinomas of the cervix were cured by operation or by radium is not of much value. For example the histological structure of carcinoma of the cervix seems to determine the fate of the patient. McNamara[7] describes two groups: (1) those of high malignancy, comprising 276 cases all of which were dead within three years; (2) those of low malignancy all living after five years (15 cases). The characteristic picture in low malignancy is epithelial pearls with tendency to keratohyalin formation. Therefore, records must include histological classification as well as clinical or anatomical classification, that is, knowledge of the cell and knowledge of gross structure and distribution.

Deep X-ray Therapy: The use of deep X-ray therapy as a routine post-operative measure has at times been attacked. Himmelman's cases[8] (Groups I, II, III, IV, Jungling system) gave, for surgery alone, 42 per cent alive at the end of three years and 36 per cent alive at the end of five years. The cases treated by operation and postoperative radiation gave 32 per cent alive after three years, and 16 per cent after five. The same conclusion was expressed in an address given in Minneapolis by W. A. Coventry of Duluth. However, I am not satisfied that more recent development of radiation has not rendered these figures obsolete.

The effect of deep X-ray on the patient is marked. It is probable that abuses occur to some extent. Its effect on glands of internal secretion should be kept in mind. The following methods of application have been the subject of much controversy as to which one was best. The best method is far from established.

I. Filtered fractional high voltage rays, repeated often for a considerable time.

II. Massive doses, as employed by Seitz and Wintz in Germany, are in some respects the direct antithesis of I.

III. Kingerey's saturation technic based on the theory of quantitative loss of biological effect with successive rays. Attempt is made to maintain the saturation by successive doses.

IV. The so-called "carcinoma dose," in other words, the dose sufficient to cause an erythema or burn. This apparently is not as popular as it once was, for the reason that cancer seemed to spread in the X-ray scars.

Much valuable information is available. *The American Journal of Roentgenology and Radium Therapy* has devoted a large part of the April, 1932, number to a discussion of therapy for cancer of the breast. At the end of this discussion is a symposium by Ewing, Pancoast, Kaplan, Dorrance, and Neil. In order to bring the question before the Society and that we may judge of the magnitude of the problem of cancer treatment, I have presumed to present a very brief abstract of certain papers. Special consideration should be given to the table giving the number alive with no treatment and various forms of treatment. One feels discouraged, but is goaded to greater effort in attacking the dilemma. The abstracts are as follows:

Results of Radiation Therapy in 1,022 Private Cases of Carcinoma of the Breast from 1902 to 1928: George E. Pfahler[9]: "Radium is in my opinion relatively more powerful for its local effect on cancer than the roentgen ray, but for deep effects and a wide distribution, it is of less value unless used in very large quantities at a distance." "Mr. Sampson Handley believes that breast cancer when it comes to operation is always an intrathoracic condition and rational treatment is to irradiate the chest more thoroughly with attention to lymphatic areas. The time for irradiation is two weeks after operation."

Comparative value of operation and radiation at end of three years:

	Alive (%)
No treatment	24
Incomplete operation	29
Complete operation	51
Complete operation and irradiation	66

Post-operative Roentgen Therapy for Cancer of the Breast. 103 Consecutive Cases. U. V. Portmann[10]: "It is very questionable whether malignant diseases can be completely eliminated where the axilla is involved, even by the most skillfully performed operation."

Forty per cent of those operated remain alive and free from manifestations three years.

Thirty per cent of those operated remain alive and free from manifestations five years.

Fifty per cent of those operated plus radiation free from manifestations three years.

Forty-two per cent of those operated plus radiation free from manifestations five years.

Treatment of Metastases and Inoperable Mammary Cancer. Frank E. Adair.[11] Treatment of metastasis and inoperable primary cancers is discussed. Bloodgood's statistics are quoted as follows:

"Five-year cures, no axillary involvement.....70 per cent.
Five-year cures with axillary involvement.....20 per cent."

"To my mind the most outstanding problem of breast cancer is the question of how to treat the axilla. It is the only area of metastasis where we may still hope to obtain a cure after metastasis has occurred." Radium seeds are advocated after surgery. For example, S. Z., female, aged 34, on admission to the Breast Clinic, was classified as primary inoperable mammary cancer, on account of its being metastatic to the axilla and the supraclavicular region. The patient was given a high voltage roentgen cycle of four treatments, two of which were directed into the axilla, the last being on January 7, 1929. Following this treatment (January 27, 1929) the patient was given 14,000 mc.-hr. by radium element pack over the axilla. One month later the supraclavicular nodes and the breast disease had disappeared. The axillary disease was slightly diminished in size but still persisted. On August 15, 1929, 21 mc. of radon were placed in the axilla in gold seeds. Two months later there was complete disappearance of the axillary mass, and to date, January 1, 1931, 22.5 months afterward, there has never been any recurrence of a previously bulky axillary mass. The pathological report was "cellular adenocarcinoma." This case report is given in that it emphasizes necessity of equipment.

Interstitial Use of Gold Filtered Radon Transfixation Tubes. George Pack.[12]

Pack urges his method as a substitute for surgery and not as an adjunct. Primary inoperable cases just beyond the borderline of operating are suitable for this method.

The surgeon is concerned with these treatment problems and should have some intelligent idea of the methods proposed. The effect of X-rays on the patient must be considered, such as pain, digestive disturbances, weakness, and even the necrosis that sometimes causes the death of the patient if used with no other idea than

annihilation of cancer cells. It is only possible for the physician to meet the problems involved by correlation of efforts on the part of the entire profession. Such an effort can come only through widespread coöperation, in which local societies and groups should take part. The American College of Surgeons is probably the proper organization to carry out in general fields what it has accomplished in bone tumors. No method has escaped criticism. It is apparent that much would be gained by the including of roentgen specialists in our local committee. Cancer of the breast has received much attention in the preliminary sketch. My reason for this has been the discouraging results most of us have had with recurrence from six months to as late as fifteen years, following operation. The end-results as indicated by Dean Lewis are not over 10 per cent cure. After reading Pack's article and that of Burton J. Lee,[13] I still believe that surgery should not be entirely eliminated.

The precancerous lesions probably offer a more attractive field. In brief, they are:

I. Stomach: (1) atrophic gastritis (Billroth and Rehfuss); (2) ulcer (Wilson); (3) polyps.

II. Breast: All tumors (immediate biopsy).

III. Skin: Eller and Anderson[14] attempt to show that there are at least twenty skin conditions which may be forerunners of cancer, the recognition and judicious treatment of which might aid in lowering the mortality rate from the later disease: (1) syphilis, especially of the mucosa of the mouth and tongue; (2) leukoplakia of the tongue, lips, and buccal muscoa; (3) roentgen and radium sequelæ, especially keratoses; (4) moles, especially the bluish-black or slate-black variety; (5) senile keratoses (keratoderma); (6) kraurosis vulvæ; (7) occupational keratodermas, as those occurring in workers exposed to coal tar, arsenic dust, heavy grade mineral oils, shale oil, roentgen-rays, and radium; (8) lupus vulgaris; (9) keratoses resulting from the external use of arsenic; (10) sebaceous cysts, chiefly on the face and scalp; (11) lupus erythematosus, usually of long standing; (12) varicose ulcers (in which, however, the incidence of cancer is surprisingly low, and fistulæ, chiefly about the ankles and calves; (13) Paget's disease of the nipple, considered by many authorities as a true cancer rather than a merely precancerous condition; (14) cicatrices, especially from third-degree burns; (15) cutaneous horns most frequently found on scalp and face, less often on buttocks, penis, scrotum, and nails; (16) Bowen's disease, an extra-mammary Paget's disease; (17) papilloma of the tongue; (18) xeroderma pigmentosum; (19) rarely, inflammatory dermatoses, as eczema, lichen planus, and psoriasis.

IV. Cervix: leukoplakia (Hinselmann).

V. Mouth and Tongue: leukoplakia.

VI. Bladder: papilloma.

I have tried to demonstrate to the Surgical Society that the treatment of cancer, particularly of the breast, is not in a satisfactory state. It is for the purpose of collecting knowledge and later distributing it that the demand is made for a Local Cancer Committee. The members of this committee, each in his own chosen field, can make a complete study of the literature and determine what should be done. With this information it is probable that a suitable armamentarium can be assembled to render the treatment of cancer more certain and satisfactory.

In Minneapolis we have a supply of radium. The largest amount is about one-third of a gram. No survey of radium has been made but this could easily be done by the local committee. In Minneapolis two plants for deep therapy exist. More definite knowledge of these could be ascertained. The details of measuring X-ray radiation have been established by the Bureau of Standards at Washington. This is for the physicist.

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SCOT TISSUE

The urge to overdo in advertising is not better exemplified than in the recent exploitation of Scot Tissue toilet paper. Scot Tissue has recently been advertised as being "chemically pure"—though for what reason it should be so pure is not obvious. It is defined as being "The absorbent soft white toilet tissue . . . medically safe . . . approved by doctors, hospitals and health authorities." In recent months the firm has reverted to "Science"—with a capital S—to aid it in its efforts to inform the public of the absolute safety of these absorbent rectal-health tissues. The advertising agency of the Scott Paper Company, evidently realizing the possibilities of chemical examination, set forth to have "research" done in a "nationally-known laboratory." In advertisements giving the results of this "investigation" is the warning: "Science finds Harmful Acids . . . Mercury . . . Arsenic in many brands of Toilet Tissue." "660 Brands Tested . . . 2 out of 3 found 'Unsafe . . unfit to use.'" "Use only tissues you know meet the standards which physicians approve." The Scott concern has dragged in the good name of medicine in an attempt to make the public believe that "medical science" had investigated the toilet paper problem and had found certain samples to contain arsenic, mercury and other substances "in sufficient quantities to cause rectal illness." Neither independent research nor the Scott concern's own investigation have proved any such thing. (Jour. A. M. A., July 16, 1932, p. 241.)

ESTIVIN

The producer's statement as to the composition of "Estivin" that it is an "extract of rosa gallica (red rose)" is indefinite and meaningless; the product has not been accepted by the Council on Pharmacy and Chemistry. The evidence regarding the efficacy of the product is conflicting. It is probably of little actual value, as patients, generally, are not enthusiastic about continuing its use. (Jour. A. M. A., January 23, 1932, p. 341.)

BOOK REVIEWS

Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.

BOOKS RECEIVED FOR REVIEW

THE FAILING HEART OF MIDDLE LIFE. Albert S. Hyman, A.B., M.D., F.A.C.P. Cardiologist, Beth David and Manhattan General Hospitals, etc. 538 pages. Illus. Price, $5.00, cloth. Philadelphia: F. A. Davis Company, 1932.

THE CURATIVE VALUE OF LIGHT. Edgar Mayer, M.D. Consultant in Light Radiation to the American Medical Association, etc. 175 pages. Illus. Price, $1.50, cloth. New York: D. Appleton & Company, 1932.

THE SPUTUM. Its Examination and Clinical Significance. Randall Clifford, M.D., Associate in Medicine, Peter Bent Brigham Hospital, Assistant in Medicine, Harvard Medical School. 167 pages. Illus. Price, cloth, $4.00. New York: The MacMillan Co., 1932.

FUNCTIONAL DISORDERS OF THE LARGE INTESTINE AND THEIR TREATMENT. Jacob Buckstein, M.D. Instructor in Gastrointestinal Roentgenology, Cornell University Medical College, etc. 265 pages. Illus. Price, $3.00, cloth. New York: Harper & Brothers, 1932.

MENTAL DEFICIENCY DUE TO BIRTH INJURIES. Edgar A. Doll, Ph.D., Director of Research, Training School at Vineland, Winthrop M. Phelps, M.D., Professor of Orthopedic Surgery, Yale University School of Medicine, Consultant on Birth Injuries, Training School at Vineland, and Ruth Taylor Melcher, M.A., Research Assistant, Training School at Vineland. 289 pages. Illus. Price, cloth, $4.50. New York: The MacMillan Co., 1932.

PRACTICAL TREATMENT OF SKIN DISEASES. Eduard Ahlswede. 770 pages. Price $12.00. New York: Paul B. Hoeber, Inc., 1932.

The average physician needs a volume on practical skin therapy and may rightfully complain that the size, detail and cost of this effort tend to eliminate it from the "practical" class. The preparation of this volume was a most ambitious undertaking. Arranged logically and systematically, it contains much valuable information and many prescriptions which have been handed down by famous dermatologists. With Teutonic thoroughness, the author lists all of the remedies and procedures which have been suggested for each condition, so that the multiplicity of suggestions is sometimes bewildering. The volume is a veritable encyclopedia for the dermatologist.

THOMAS MYERS, M.D.

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MINNESOTA STATE MEDICAL ASSOCIATION

Seventy-ninth Annual Session

Saint Paul, Minnesota

SECOND MEETING OF THE HOUSE OF DELEGATES*

Tuesday Luncheon, May 24, 1932

The meeting convened at twelve-fifty o'clock, President Henderson presiding.

PRESIDENT HENDERSON: Please come to order.

The first matter of business is a summary of the minutes of the previous meeting.

Secretary Meyerding read the minutes of the previous meeting.

PRESIDENT HENDERSON: You have all heard the minutes, gentlemen. Are there any alterations or corrections?

DR. F. J. SAVAGE (St. Paul): The report of the Committee on Schools for Laboratory Technicians was referred by action to the Council. It wasn't acted on by the House.

PRESIDENT HENDERSON: Are there any further corrections? If not, may we have a motion?

DR. HAGEN: I move that the report be accepted.

The motion was regularly seconded, was put to a vote and carried.

PRESIDENT HENDERSON: We will have a roll call.

Secretary Meyerding called the roll, and the following delegates and alternates responded:

SOCIETY	DELEGATE	ALTERNATE
Blue Earth Valley	A. J. Henderson, Kiester	
Clay-Becker		O. O. Larsen, Detroit Lakes
Goodhue County	M. W. Smith, Red Wing	
Hennepin County (Minneapolis)	A. S. Hamilton	
	E. A. Loomis	
	J. M. Hayes	
	Ivar Sivertsen	
	Chas. R. Drake	
	W. A. Fansler	
	Julius Johnson	
Houston-Fillmore		C. B. Eby, Spring Valley
Lyon-Lincoln	E. T. Sanderson, Minneota	
Mower County	P. A. Lommen, Austin	
Olmsted County (Rochester)	F. A. Willius	
	A. W. Adson	
	W. I. Lillie	
	W. F. Braasch	
	L. W. Pollock	
	R. D. Mussey	
Park Region	A. J. Lewis, Henning	
Ramsey County (St. Paul)	E. M. Hammes	K. Dedolph
	W. C. Carroll	A. G. Schulze
	Joel C. Hultkrans	
	Wallace H. Cole	
Red River Valley		J. F. Norman, Crookston
Redwood-Brown Rice County	Geo. B. Weiser, New Ulm	F. J. Lexa, Lonsdale
St. Louis County	B. S. Adams, Hibbing	
	J. R. Manley, Duluth	
	F. H. Magney, Duluth	
	C. L. Haney, Duluth	
Scott-Carver Minnesota	H. A. Schneider, Jordan	
Southwestern	S. A. Slater, Worthington	
Steele County	A. B. Stewart, Owatonna	
Upper Mississippi	J. A. Thabes, Brainerd	
Washington County	E. S. Boleyn, Stillwater	
Winona County	C. P. Robbins, Winona	
Wright County		E. Klaveness, St. Paul

PRESIDENT HENDERSON: Report of the Credentials Committee.

DR. STEWART: Forty-five were handed in yesterday, and three today, which makes forty-eight, all told.

*Minutes of the first meeting were published in the September number of MINNESOTA MEDICINE, pp. 615-646.

PRESIDENT HENDERSON: There were forty-eight credentials handed in, and thirty-eight are present. Is that it?

Now, we will have the report of the Council meeting. Dr. H. M. Workman read the report of the Council.

SECOND MEETING OF THE COUNCIL

The second meeting of the Council of the Minnesota State Medical Association was held at noon, Monday, May 23, at the Minnesota Club.

The chairman called the meeting to order.

The following were present: Dr. M. S. Henderson, Dr. H. M. Workman, Dr. W. A. Coventry, Dr. F. J. Savage, Dr. W. H. Condit, Dr. L. Sogge, Dr. H. Z. Giffin, Dr. W. W. Will, Dr. O. J. Hagen, Dr. J. S. Holbrook, Dr. W. A. Piper, Dr. E. A. Meyerding.

The Secretary read a resolution from the Committee on Schools for Laboratory Technicians. A discussion followed.

The Secretary also read the second, third and fourth resolutions. A Committee consisting of Dr. Condit and Dr. Savage was appointed to investigate and report at the next meeting of the Council.

The Secretary read a letter from Dr. A. J. Chesley, regarding the White House-Minnesota Conference on Child Health and Protection. A motion was made and carried that the Committee on Public Health Education be designated to work in conjunction with the State Planning Committee of the State Department of Health, and report to the Council in the fall.

The report of the Radio Committee was considered. The matter was referred to Mr. Price of the Extension Division, University of Minnesota, and upon his request the following telegram was sent to the Federal Radio Commission at Washington, D. C.

"Minnesota State Medical Association has taken position endorsing application of three educational institutions for additional time in their controversy over station WRHM of Minneapolis."

The Chairman reported on the care of the indigent in his county.

A motion was made and carried that the Committee on State Health Relations be requested to institute a question and answer column or correspondence on laws concerning the care of the indigent.

The meeting adjourned.

DR. W. H. CONDIT (Minneapolis): I would like to make one correction there. The Y. W. C. A. of Minneapolis was enjoined legally against giving adverse information to prospective students to the Northwestern Institute. That has nothing to do with these resolutions, but that is pending now.

PRESIDENT HENDERSON: Any furher corrections or comments?

DR. CHARLES R. DRAKE: I think I can give you a little more information in regard to that injunction proceeding against the Y. W. C. A. The Vocational Department of the public schools of Minneapolis and the Y. W. C. A. have been asked at various times for information about these commercial courses for laboratory technicians. On the advice of a committee on medical technicians they have come to us for advice, and have asked what we thought of it. Of course, our opinion wasn't very favorable, and they have passed this information on to a large number of students who have asked them for this information. This one school particularly didn't like it.

I feel it is perfectly right for anybody to pass on

and give judgment upon any school of any kind or description in the United States, or the state of Minnesota, or anywhere as to what you think about it without infringing upon your rights as a citizen of the United States. Therefore, they have been passing this information on to these people.

Then an injunction proceeding was instituted against the Y. W. C. A., against the Travelers Aid, and a few others for the purpose of getting them to keep their mouths shut. I happen to be quite intimately connected with that thing, and although they brought the injunction against those people they didn't bring it against me. They are not willing, nor do they care. They are afraid to monkey with the medical association. Answers are being brought in. The thing is being delayed.

I think the Y. W. C. A. and its attorney will beat this case. Through education, these schools will fall by the wayside gradually, but our committee wanted not a condemnation of those commercial schools—no. We merely want adoption of the principles as laid down by the American Society of Clinical Pathologists. The American Society of Clinical Pathologists has an approved list of schools. They also have a registry for technicians. There are certain standards they have to meet in order to get into either one, and it is with the hope of the endorsement of this program by the American Society of Clinical Pathologists that these resolutions were put forth. It was not desired to make any statement to condemn any commercial school, but by reason of the approval of the opposite the commercial schools will fall by the wayside.

I hoped that some such action could be taken at this session so that we would have some strength in order to carry on this fight against the injunction. I don't believe the injunction will carry through. If it does, it won't make any difference. It merely takes the Y. W. C. A. and says they can't tell anybody about any school in Minneapolis, or any other place. I don't think it is within the rights of citizenship to compel you to keep your mouth shut as to whether Hammond University, or any other university, is good, bad, or indifferent.

I make these few remarks because I happen to be intimately connected with the Y. W. C. A. proposition and know the inside procedures. They have referred student after student to me, to Dr. O'Brien, to Dr. Rigler, Dr. Schulze, and to others for information along this line, and we have given our information not condemning them openly in any way but simply not giving them our approval, and in that way we claim we have not slandered them. Furthermore, these schools do not have men who are members of the State Medical Association or the County Medical Association. None of them are especially in good standing and those things can be cited.

In a roundabout way they have even threatened me, but I am not afraid of their threats. You have to take this thing in hand. The medical profession should control the education of these medical technicians, and it should also discourage the indiscriminate handing out of diplomas through these diploma mills.

We have grass widows, sod widows, old worn out nurses and people fifty and sixty years of age applying for this particular work. They say it is an easy, soft-snap job, and big pay. I won't go any further.

All I wish is that we did have some sort of approval of the State Association of the stand of the American Society of Clinical Pathologists, not necessarily the approval of all those resolutions that were offered, but the standard of the American Society of Clinical Pathologists which has also been approved, I am quite certain, by the American Medical Association. We do not mention and have never mentioned, and do not propose to mention any of the schools excepting in the general terminology as a commercial school.

DR. C. B. WRIGHT: Has this matter been brought up and acted on in any way by the Hennepin County Society?

DR. C. R. DRAKE: I rendered one report to them, and brought up that mandamus or injunction proceeding and showed it as being a good thing for the archives of the society. My report was accepted by the Hennepin Society. The Public Welfare Committee of the Hennepin County Medical Society has also endorsed our work and our stand on the proposition. The Ramsey County Medical Society have informed certain members of their organization that if they had anything to do with any of these schools they would lose their membership in the county society. That is the stand of those two societies.

PRESIDENT HENDERSON: Dr. Workman. have you anything to say?

DR. WORKMAN: Nothing further. I knew nothing about it except what came before the Council.

PRESIDENT HENDERSON: As it came before the Council, I think the consensus of opinion was that there was some possibility of a medico-legal aspect to this thing, and that we had to go slow. This is the kind of information we want, and I am sure the Council would be glad to hear from Dr. Drake about it.

Is there anything further?

DR. A. G. SCHULZE (St. Paul): In the past while I was chairman of this committee, and looking back now, I am surprised I haven't been under arrest for all the answers I have given to prospective students. In the past I have been telling prospective students the reason we don't endorse those schools is because they are not endorsed by the organized medical profession of the state. Is there a better answer than that that can be given?

DR. C. R. DRAKE: That is the best answer.

DR. SCHULZE: There is no argument.

PRESIDENT HENDERSON: You have heard the report of the Council.

DR. WORKMAN: I move it be adopted.

DR. ADAMS: I second the motion.

The motion was put to a vote and carried.

PRESIDENT HENDERSON: The next matter of business is an important one, the election of officers. I will call for nominations for the office of President.

DR. J. M. HAYES (Minneapolis): I would like to place in nomination the name of Dr. Pearce of Minneapolis. He is a man who has done a great deal of work for the state association and the public health association, and I know of no better man for this position.

PRESIDENT HENDERSON: You have heard the nomination of Dr. Pearce of Minneapolis.

DR. E. S. BOLEYN (Stillwater): I wish to second that nomination.

PRESIDENT HENDERSON: Are there any further nominations, gentlemen?

DR. ADAMS: I move that nominations be closed.

The motion was regularly seconded, was put to a vote and carried.

PRESIDENT HENDERSON: Dr. Pearce is elected. I will appoint a committee of three to escort Dr. Pearce in: Dr. Hayes, Dr. Carroll and Dr. Boleyn to inform Dr. Pearce that he has been elected to the office of President.

DR. C. B. WRIGHT: May I suggest that I don't think this thing is legal until someone moves that the Secretary cast the ballot for Dr. Pearce.

PRESIDENT HENDERSON: Will somebody kindly make a motion?

DR. HAGEN: I move that the Secretary be instructed to cast the ballot for Dr. Pearce.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary hereby casts the unanimous ballot of the Association for Dr. N. O.

Pearce of Minneapolis as President of the State Society for the next year. (Applause.)

While we are waiting, the President asked me to read a telegram from the Iowa State Medical Society:

> Greetings from the Iowa State Medical Society and best wishes for a successful, worthwhile meeting.
> R. L. Parker, Secretary,
> Iowa State Medical Society.

The audience arose and applauded as President-Elect Pearce was escorted into the room.

PRESIDENT HENDERSON: I want officially to congratulate Dr. Pearce. I think the Association is very fortunate in having Dr. Pearce as President. He has shown a great deal of interest in the State Association for many years. He is a man of executive ability, and I know he is untiring in his efforts for the furtherance of the interests of the society. Dr. Pearce, we should like to hear a few words.

PRESIDENT-ELECT PEARCE: It is needless to say I feel very greatly honored, and I certainly feel very grateful to you all for conferring that honor on me. As I look around this room, I know there are any number of men who are more deserving probably of this honor than I am, or ever will be, and I don't know how I can qualify for this office any better nor as well as a great many of you.

If a very sincere interest and endeavor to advance the welfare of the medical profession and the University Medical School and the other medical institutions of the state will act as a qualification, I believe I have that very much at heart.

Thank you.

PRESIDENT HENDERSON: Next is the office of First Vice President.

DR. W. W. WILL (Bertha): I would like to place in nomination a man who has ever shown an interest in the Association, and of late years has been a very worthy Councilor, W. A. Piper of Mountain Lake.

The motion was seconded.

DR. HAGEN: I move that nominations be closed and the Secretary instructed to cast the unanimous vote of the Association for Dr. Piper.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary casts the unanimous vote of the Association for Dr. Piper of Mountain Lake as First Vice President.

PRESIDENT HENDERSON: Nominations are in order for the Second Vice President.

DR. F. J. LEXA (Lonsdale): He has been past president of the Southern Minnesota Association and Vice President of the Rice County Medical Society. He has always been very active in all the work, and is very well known to you, and that is Dr. Fred Huxley of Faribault, Minnesota.

The nomination was seconded .

DR. H. M. WORKMAN (Tracy): I move that the Secretary be instructed to cast the ballot.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary hereby casts the ballot for Dr. Huxley of Faribault as Second Vice President.

PRESIDENT HENDERSON: Office of Secretary.

DR. E. M. HAMMES (St. Paul): I move that the present incumbent be continued.

The nomination was seconded.

DR. W. W. WILL: I move that nominations be closed and that the President be instructed to cast the unanimous ballot for E. A. Meyerding.

The motion was regularly seconded, was put to a vote and carried.

PRESIDENT HENDERSON: The President hereby casts the unanimous vote of the Association for Dr. Meyerdoing as Secretary. You are elected.

Nominations for office of Treasurer.

DR. W. A. FANSLER (Minneapolis): I place in nomination Dr. Bill Condit.

The nomination was seconded.

DR. FANSLER: I move that nominations be closed and the Secretary cast the ballot.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary hereby casts the unanimous ballot of the Association for Dr. Condit as Treasurer.

PRESIDENT HENDERSON: There are three Councilors to be elected. The First District.

DR. A. W. ADSON (Rochester): I hereby nominate Dr. Griffin.

The nomination was seconded.

DR. C. P. ROBBIN: (Winona): I move that nominations be closed and the Secretary cast the ballot.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary casts the ballot for Dr. Griffin as Councillor for the First District.

PRESIDENT HENDERSON: Councilor for the Second District. W. A. Piper is the incumbent.

DR. E. S. BOLEYN (Stillwater): I nominate Dr. Sogge.

The nomination was seconded.

DR. H. M. WORKMAN (Tracy): I move that nominations be closed, and the Secretary instructed to cast the ballot.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary casts the ballot for Dr. Sogge as Councilor for the Second District.

PRESIDENT HENDERSON: Councilor for the Ninth District. Dr. Coventry is the present incumbent.

DR. C. L. HANEY (Duluth): I nominate Dr. Coventry to succeed himself.

The nomination was seconded.

DR. MAGNEY: I move that nominations be closed and the Secretary be instructed to cast the unanimous ballot for Dr. Coventry.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: The Secretary hereby casts the unanimous ballot for Dr. Coventry as Councilor for the Ninth District.

DR. E. KLAVENESS (St. Paul): Dr. Pearce was Councilor for Hennepin County of the Sixth District. Consequently, it would be necessary to elect a man in his place. I nominate Dr. J. M. Hayes of Minneapolis.

DR. H. M. WORKMAN: I move that nominations be closed and the Secretary instructed to cast the ballot.

DR. W. A. COVENTRY: To fill out the unexpired term.

The motion was regularly seconded, was put to a vote and carried.

SECRETARY MEYERDING: I hereby cast the unanimous ballot of the Association for Dr. Hayes as Councilor for the Sixth District.

PRESIDENT HENDERSON: We have to take up the election of delegates to the American Medical Association, two of whose terms have expired. The Council has nominated H. M. Johnson of Dawson, with Dr. E. A. Meyerding as alternate, and with W. F. Braasch as delegate, and W. L. Burnap as alternate.

Are there any other nominations? Would anybody like to nominate any other men from the floor? These are the only two vacancies there are. These men are elected for a term of two years.

DR. BOLEYN: I move the nominations be closed.

The motion was regularly seconded, was put to a vote and carried.

DR. C. R. ROBBINS: I move that the President cast the unanimous ballot for the election of these four

men: Dr. Johnson, with an alternate of Dr. Meyerding; Dr. Braasch, with an alternate of Dr. Burnap.

The motion was regularly seconded, was put to a vote and carried.

PRESIDENT HENDERSON: The President casts the ballot for the gentlemen named.

The next order of business is the time and place of the next meeting, and I think I should say a few words about this meeting because I have been pretty much in touch with what has gone on. I just want to say that I think this is the finest state meeting of any kind at any place that I ever attended. Our exhibits, I think, are remarkable. The arrangement is convenient, and we are having a fine attendance.

Those things don't happen out of the thin air. Somebody has to do some work, and I know very well how hard Dr. Meyerding has worked at this sort of thing. It is all well enough to say, "That is Dr. Meyerding's job." That is his job, but there are certain things beyond that he has to do to put a thing over with a zip and a bang.

Dr. Meyerding has been at the beck and call of everybody about this thing for months, and I think we can't be too unanimous in our appreciation of what he has done, and his staff, one and all.

I also want to take this occasion to thank the Committee on Scientific Assembly for the work they have done. We started out with the idea of making this a real fine scientific meeting, so that the men who came would feel they at least got their money's worth. As I say, it is unique in our own history.

So we have to be exceedingly careful in selecting a meeting place. If this is the type of meeting we want it has to be held in such a place as these accommodations can be secured. We want to keep that very clearly in mind if we want this kind of meeting. It is hard to get a place to accommodate such a large meeting. We had 678 doctors registered at noon today, with a total registration of 1,048, which shows that it promises to be the largest meeting we have had. As I wandered around those booths this morning and saw all those fine things on display, I wanted to run here and there and see all the things, but I couldn't get to half the places there is so much going on.

Yesterday I had a very fine looking young man from Minneapolis come along and present me with this. I must read it.

President Henderson read the letter, which was a letter from the business interests of Minneapolis inviting the Minnesota State Medical Association to meet there in 1933.

DR. W. F. BRAASCH (Rochester): Representatives of the county came prepared to invite the Association to hold its next meeting in Rochester if the House of Delegates would care to come. However, since we have come here we have learned from our worthy Secretary, Dr. Meyerding, that if the meeting were held outside of the Twin Cities the system of both the commercial and scientific exhibits might be inhibited, and the success of the meeting in the future along the line he has planned and carefully developed with such signal success might be impaired in the future.

We have referred to his wishes in the matter, and in view of this I offer a motion that the matter be referred to the Council and that they appoint a committee to investigate as to the resources of various other cities outside of the Twin Cities where a meeting might be held in the future, and we will abide by their decision in the matter.

The motion was regularly seconded.

DR. L. SOGGE (Windom): May I just have a word on that motion? During my term as President, and before that in the Council, I know there has been considerable talk about making the arrangements that we have at the present time. Dr. Meyerding worked tirelessly for such an arrangement, and I think he has proven, after we finally granted that he was able together with his committee to make a grand success of this arrangement.

I have made it sort of my duty to go around and see some of those fellows who are having their commercial exhibits here, and most of them have said they have never been to a national meeting or a state meeting anywhere where they had better arrangements than they have over here, and they are very highly pleased with it.

As you know, the state meeting has at different times been some expense for the State Association. If you can go on at this rate, soon the commercial exhibits will take care of the state meeting and probably bring us something into the treasury.

I feel we should give Dr. Meyerding, together with the Council, the right to carry this idea further, so I am glad to second the motion of Dr. Braasch.

PRESIDENT HENDERSON: Dr. Meyerding, would you like to say something?

SECRETARY MEYERDING: This question of an annual meeting, if you have to do the work, is a sort of mixed up affair; you get so many different angles working.

I was very heartily in favor of Rochester two weeks ago before I went to the A. M. A. because I knew we would have the greatest scientific meeting in our history.

We have been approached from time to time and told what a wonderful meeting the Minnesota Dental Association puts on. They have put on a meeting for several years in which their gross income was somewhere between $10,000 and $14,000 from exhibits, and I understand they run practically their whole state society on that money, that is, it goes a long way toward paying their expenses.

I thought it might be the wish (at least that is the way I interpreted it) of the organization that we make some money out of these meeting. How we are going to come out this year, I can't tell. Our preliminary estimate was that our meeting this year will cost our treasury about $500 less than the previous meeting, and you had a greater meeting.

I think the motion to leave it to the Council is a fit one for several reasons. I have watched the A. M. A. in their meetings, and they leave it to, I don't know who, the trustees or the secretary, Dr. West, or somebody who makes all decisions on all meetings. They investigate the places, the opportunities and the privileges extended to them.

This is, of course, an experiment. We are developing this thing, and I think the motion is proper. I am sure you can rest assured the Council will take the proper action. I think it is a very fit motion and will lend itself to the plans as have been discussed in the past, and I hope the motion goes through.

PRESIDENT HENDERSON: Is there any further discussion?

The question was called for, was put to a vote and carried.

PRESIDENT HENDERSON: Tomorrow at eleven o'clock at the General Assembly we had planned to present our President-Elect, and I would ask the same committee who escorted him into the room to present him there. All the officers should be there at the time of presentation. All the present incumbents and new officers should be there at that time.

The next order will be any new business.

DR. COLLINS: As Chairman of the Reference Committee, I believe we have one report which is being considered by the Council. The Committee on Public Health Nursing I believe had their meeting yesterday and were to report to the Council meeting today, and there has been no mention of it.

PRESIDENT HENDERSON: That will be presented to the Council today. Is there any other business?

DR. HARRY OERTING: The Committee on Public

Health Nursing held a meeting last evening in my office. The committee is rather new, as you probably know, and there is a great deal of work that needs to be done before we can give any information that will be of much value.

It seems that the Association of Public Health Nurses had passed a bill through the legislature some years ago which they now wish to amend. I have seen a copy of their amended bill and there are a great many things in it that we as an Association couldn't agree to. The matter will have to be taken up with them and ironed out.

Then the law as it now stands, as I understand it, provides that all public health nurses are elected by county boards, and the law provides that there must be on that board either the county health officer or some registered physician. We don't know whether these county boards are complying with the law. One of the functions the committee hopes to accomplish this year is to make a contact with every county society and see that they appoint a committee on public health nursing, and appoint someone who will be active and get in touch with these commissioners and see that one of their members is appointed on that committee. In that way, we can more or less control the appointment of these public health nurses. That matter will be taken up by the committee immediately and by your next session we expect to have some valuable information along that line.

There are approximately 400 nurses doing public health nursing in the state today. I am told by Dr. Locken, who is on the certification board of public health nurses that ten per cent of this number are uncertified for various reasons. We will get in touch with the public health nursing association and have them send us a list of these some forty nurses who are not certified, investigate why they are not certified, and take up with the local community where they are being employed and see what we can find out as to how they happen to be working without certification.

As the law now stands, the law says that the public health nurses must be certified, but the law doesn't say that you have to hire a certified nurse if you don't want to. There are numerous instances through the state where all sorts of politics are taken advantage of. Out on the Range, for instance, I am told that in one of the cities up there every time a new mayor goes in all the public health nurses lose their jobs and others get them. In one town on the range today where a new mayor was elected some time ago, I am told they discharged the public health nurse who had been working there for three years, and hired three practical nurses each of them to work ten days a month, which of course isn't conducive to good work. So we hope at your next meeting to be able to give you a report which will have some value.

PRESIDENT HENDERSON: Is there any further discussion? You have all heard the report.

DR. HAMMES: I move it be accepted.

The motion was regularly seconded, was put to a vote and carried.

DR. HAGEN: I hereby make this resolution, that a vote of thanks be extended to the Ramsey County Medical Society, the Lowry Hotel, the St. Paul Auditorium, the St. Paul associations, the Daily News and the Daily Dispatch, and the Pioneer Press Dispatch.

PRESIDENT HENDERSON: We have had a very pleasant time here. I am sure we all want such a resolution.

The motion was severally seconded, was put to a vote and carried.

SECRETARY MEYERDING: Did you want to include the exhibitors?

DR. HAGEN: Yes.

DR. F. J. SAVAGE (St. Paul): It seems to me a very fitting thing at this time to pass a vote of appreciation to the organizations which have provided the scientific exhibits at our meeting this year.

PRESIDENT HENDERSON: The motion was just amended to include the exhibitors.

Just to be sure, is there any further business anybody would like to bring up, or anything anybody would like to discuss? In my hurry to get through, I don't want to give the impression that I want to choke off discussion.

If there is nothing further, I will entertain a motion to adjourn.

DR. HAGEN: I so move.

The motion was regularly seconded, was put to a vote and carried, and the meeting adjourned at one-forty o'clock.

SCIENTIFIC PROGRAM

The scientific program of the annual meeting was carried out as published in the May number of MINNESOTA MEDICINE with the following exceptions:

In the absence of Dr. Olin West, the Medical Economics meeting, Monday evening, was addressed by Dr. Morris Fishbein, editor of the A. M. A. Journal.

In the absence of Dr. L. G. Rowntree, Dr. Russell Wilder, Rochester, presented a paper entitled "A New Endocrine Disease—Hyperparathyroidism" before the Section on Medicine, Wednesday morning.

In the discussion of the paper entitled "Observations on Arterial Hypertension" presented by Dr. Ralph Major on Wednesday afternoon, Dr. E. T. Bell was replaced by Dr. S. Marx White, Minneapolis.